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NOTES.

Notice to Subscribers.—With this issue a new volume of the *Journal* is commenced. Subscribers are notified that their subscriptions are due; and those requiring the *Journal* to be continued must send it at once, as no more copies will be sent unless subscriptions are paid.

Cows' Udders.—In an experiment made a few years ago, Professor Plumb found that in 13 cows which had the front part of the udder much smaller than the rear part, he obtained 57 per cent. more milk from the hind teats. With 226 milkings from 65 cows, which had udders not apparently much smaller in front than rear, he obtained 4·1 quarts as an average from front teats, and 4·9 quarts from rear teats, a difference of over 16 per cent.

According to Mr. J. O. Armour, of the great Chicago meat-packing firm, the best estimate of the world's total herds and flocks shows that there are 310,000,000 cattle, 600,000,000 sheep, 100,000,000 hogs, and a possible 70,000,000 goats, or a total of 1,080,000,000 edible live stock in the whole world to feed its estimated population of 1,500,000,000 people, of which 800,000,000 are semi-civilised grain-eating Asiatics, and 450,000,000 North Americans and Europeans.

Narrogin Experimental Farm.—Considerable progress has been made in the work at this farm. About 30 tons of good hay have been harvested, and the land is being fallowed for the next crop. Buildings are in course of erection. Two students are at present on the farm, and it is hoped that in a short time we shall have accommodation for several others. A windmill has been erected, well sunk, and water is being pumped up to the top of the hill and reticulated to the buildings.

New Publication.—It is evident that matters agronomic are on the move in South Africa. Since peace was declared two State agricultural journals have been started. The latest is "The Transvaal Agricultural Journal," the first issue of which has just come to hand. It is the same size as our own journal, and contains a number of well-written articles. Mr. A. R. E. Burton, F.R.G.S., who has worked for some time on the Cape of Good Hope Agricultural Journal, is the editor.

Agricultural Lectures at Perth Technical School.—We wish to call our readers' attention to the fact that the course of agricultural lectures for the coming year will commence at the Technical School on Monday, February 9. The lectures are delivered by Mr. Percy G. Wicken, of the Department of Agriculture, every Monday evening at 7·30 p.m., and include all branches of agriculture. The fee is only £1 for the year's course of 40 lectures, or 7s. 6d. for the quarter, and gives opportunities to those wishing to obtain a knowledge of agriculture to obtain the same at a very small cost.

ARE MELONS FRUIT?—The other day a man was asked whether a melon is a fruit or a vegetable. This inquiry led to the further question as to what is the difference between fruits and vegetables, any way? For the benefit of those who do not know, the statement is made that fruit is the part of a plant which contains the seed; but the plant itself is a vegetable. Apples, berries, melons, pumpkins, tomatoes, and the like are fruits; cabbages, radishes, beets, greens, turnips, and the like are vegetables, because it is the plant that is eaten, and not merely the part which contains the seed.

"CHEMISTRY OF THE FARM."—We have received from the publishers, Messrs. Vinton & Co., 9 New Bridge Street, London, E.C., a copy of the revised edition of R. Warrington's "Chemistry of the Farm" (No. 1, Morton's "Handbooks of the Farm"). The 250 or so pages of this volume contains a vast amount of most useful information, rendered in a form readily available even to those with only a limited knowledge of matters agricultural. We heartily commend this work to all farmers and settlers in this State who are desirous of keeping abreast of the times. The price at which it is published (2s. 6d.) places it within the reach of all.

RINGWORM IN CATTLE.—In this disease a cure is greatly facilitated by first removing the scurfy matter with soft soap and water, and then applying the remedy, which may consist of a solution of perchloride of mercury or a strong solution of alum, tincture of iodine, ointment of white precipitate, or the tincture of perchloride of iron. Any of these agents, with judicious use, prove effectual. After being dressed, the animal should be removed into fresh quarters, and receive a generous diet. Care should be taken that the stable or shed is dry and well ventilated. The infected pen should be thoroughly brushed, and washed down with strong solution of alum, and afterwards lime-whited. All the manure should then be removed, dressed with lime, and carted away from the homestead to be used on arable land; or, if only small in amount, it might with advantage be promptly burnt.

FRUIT AND ALCOHOL.—The more fruit you eat the less alcohol you will need. In the first place, the amount of water in fruit is considerable. In water melons it is no less than 95 per cent.; in grapes, 80 per cent.; in oranges, 86 per cent.; in lemons, 90 per cent.; in peaches, 88 per cent.; in apples, 82 per cent.; in pears, 84 per cent.; in plums, 80 per cent.; and in strawberries, 90 per cent.; not a fruit in the whole category containing less than 80 per cent. The irresistible conclusion, considering these facts, is that fruit plays an important part in diet as a thirst quencher. Certainly when fruits are freely represented in the diet less fluid requires to be consumed; and fruits would appear to be endowed with a subtle inimitable flavour which is ample inducement to imbibe fluid in this most wholesome form. The question so prominent in most people's thoughts as to what to drink might, therefore, on sound physiological reasoning, be answered: eat sound, ripe, juicy fruit. It is noticeable that as fruit enters into the diet the indulgence in alcoholic drinks is undoubtedly very much diminished.—*Exchange.*

PRESERVING EGGS.—The Rhode Island Agricultural Experiment Station has made a number of experiments to ascertain what methods of preservation of eggs can best be utilised to economically and effectively hold the surplus of eggs produced in spring for a few months, so that they may be used to advantage in the fall and early winter to supplement the production when eggs are scarce and costly. They advise and urge the use of the freshest eggs for the household when possible; but their experiments prove that good, clean eggs may be cheaply preserved for a considerable length of time when necessary. Such eggs when offered for sale should not be represented as fresh stock. In line with other investigators, the station found that water-glass is the best preservative. From a series of tests they found that a three per cent. solution of water-glass will preserve eggs as well as a 10 per cent. solution for a period of 10 months. The following is a summary of the results from the experiments:—Of the different methods tested in this series of experiments, the old way of using slaked lime and salt brine proved to be very effectual, and has also the advantage of being inexpensive. It is also not difficult to practise. For a period of a few weeks only, smearing the eggs with vaseline may prove an effective method of preservation. In the place of vaseline, almost any clean greasy substance may be used. For a period of a few months only, packing in dry table salt is worthy of recommendation. Of all the substances experimented with, the water-glass solution proved most worthy of commendation. The fourth series of experiments showed that the water-glass solution could be reduced to three per cent., and still retain its preserving quality. Water-glass can be obtained of druggists at from 2s. 6d. to 3s. per gallon. It is easily manipulated, and the solution may be repeatedly used. The eggs should be completely immersed in the solution; and if any eggs float, an inner cover which will sink them below the surface of the liquid should be used. In several tests where the eggs were placed in stone jars, inverted saucers were used for this purpose. The expense for the water-glass at 2s. 6d. per gallon would amount to about one-third of a penny per dozen eggs. This does not include the expense of the jar or other receptacle, which may be of stoneware, glass, or wood.

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

By Robert Hall.

PART VI.

BIRDS OFFENSIVE IN CERTAIN SEASONS TO FRUIT-GROWERS AND AGRICULTURISTS.

The word parrots practically covers the whole meaning of this part.

Others there are that could safely be placed here, but that would necessitate a withdrawal from parts in which they act with a spirit of direct service to us.

Parrots are fruit and seed eaters, as we know them, but certain of the species feed partially on scale insects. Allow me to quote a case recorded by Mr. D. McAlpine, the Pathologist to the Victorian Government:—

" The observation was made by Mr. T. G. O. Tepper, of Adelaide, upon how the destruction of honey-eating birds (some parrots) may effect the sooty mould of citrus trees. It may be mentioned the mould was practically absent when nature was less disorganised by man, and for a very simple reason. Being due to the sugary exudations of scale insects, etc., coating the trees, its abundance depends upon that of its producers, and this upon the reduction of the sugar-loving, brush-tongued parrakeets, and other birds, which formerly abounded so greatly. These I have often observed busy in the early morning among the foliage of gums, etc., upon which the honey-dew appeared. Later in the day the ants occupied these in overwhelming numbers, and drove the birds away, protecting the insects and cleaning the foliage.

The complex relation seems to be in the following form :—

1. The scale or other insects are used indirectly to attract the ants by their sweet secretions.
2. The ants, like a standing army, protect the foliage against the attacks of leaf-eating animals.
3. The abundance of honey-eating birds is necessary to keep the scale or other insects within reasonable bounds.
4. The reduction of these birds by man tends to favour the increase of the scale insects and their produce.
5. The scale and other insects now get the upper hand, and the ants, protecting the insects, also favour their increase.

6. The consequence is superabundance of honey-dew, and this is taken advantage of by the germs of the fungus to spread and multiply.

Thus the destruction of the honey-eating birds has brought about an increase of the honey-dew and of the "sooty-mould" which lives upon it, so that it is not only insectivorous birds which ought to be protected for the benefit of the grower."

The above cited observation indicates a general case of indirect help that is by no means a feeble one. This is by a section of parrots called "brush-tongued," which proves a very great nuisance to fruit-growers in the Eastern States.

The parrot tribe may assume two divisions—(*a*) Brush-tongues, (*b*) Tongues without brushes. The portion (*b*) has little to be said in its favour that calls for special mention, but that little may be noticed in that second of the subdivisions—(*b* I.), cockatoos which frequent the agricultural area, and are more or less hurtful; (*b* II.), cockatoos which frequent the heavy timber adjacent to certain fruit-growing areas, and which are beneficial.

The part (*a*) [of which certain Lories, the red-collared Lorikeet (*Trichoglossus rubritorques, V. & H.*), and the purple-crowned (*G. porphyrocephalus*), *Dietr.*, help to form the backbone] is of much more interest to us. It is the portion that holds the great mass of parrots that visit us annually, and help to cause so much annoyance and loss in the fruit crops; but as a counterbalance it is the portion that does an infinite amount of good as scale and coccid eaters.

The use of the brush-tongue in section (*a*) is to gather nectar from the "honey-pots" of the eucalypti. When there are no blossoms the use of the brush-tongues is partly discarded, but the birds are so well informed that they know scale insects contain a large amount of "honey-dew," and for the remainder of the season largely prey upon them. In this respect they differ from section (*b*), although not radically, as the Rosella has been known to clear many branches of the parasites.

The Psittaci, so named by Ritgen in 1826 and generally adopted, has its greatest diversity of types in the Australian region, but the largest numerical value in the neotropical (South America). Excluding the globe trotters (plover-like birds), parrots are reckoned as great an order of vagrants as any of the class, following as they do the flowering of the eucalyptus from the low to higher latitudes. Of 500 known species, 63 are Australian; of these 37 are West Australian. The following list will give an idea of the outline classification of the order, the first three being families (idæ termination):—

(1.) *Cacatuidæ*—Black Cockatoos, 7 species; white to rose-tinted Cockatoos, 7 species; grey Cockatoos, 1 species. (2.) *Loriidæ* (brush-tongued Parrots), 7 species; *e.g.*, Musk Lorikeet. (3.) *Cyclopsittacidæ* (Fig Parakeets), 2 species; habitat in Queensland. Family, *Psittacidæ*. (4.) *Palæornithinæ* ("Merry-thought," furcula, present), 6 species; *e.g.*, King Lory. (5.) *Platycercinæ* ("Merry-thought" bone absent), 33 species of broad tails; *e.g.* yellow-checked Rosella or yellow-collared Parrot.

YELLOW-CHEEKED ROSELLA (Yellow-cheeked Parrakeet).

Platycercus icterotis, Temm. *(Plat-i-ser'kus ic-ter'o-tis.)*

Platus, broad; *kerkos*, tail; *ikteros*, jaundice.

Platycercus icterotis, Gould, "Birds of Australia," fol., vol. v., pl. 29; "Key to Birds of Australia," Hall, p. 65 (1899).

GEOGRAPHICAL DISTRIBUTION.—Area 9.

KEY TO THE SPECIES—

Adult.—Cheeks yellow; head and under parts red; rump and upper tail coverts yellowish-green; feathers of back black, bordered with green, yellow, or occasionally red.

Young.—Nearly green on the whole plumage in the early stage; particoloured later stage.

The stronghold of the Western Rosella is in the South-West of the State. I met it in numbers about the property of the Messrs. Millar, at Denmark. Thus one finds it in the heaviest timber we have. This parrot, together with the yellow-collared Parrot, enjoyed very much associating with the horses at meal hours, for the sake of the "crumbs" that fell. Loose grain in those places was easily obtained, and the birds soon learned to know it. The note is not strong, but it is a pleasant one. The natives call the bird Moy″a-duk. When extended it is very agreeable. It flies in an undulating way, and seldom goes far. The Rosella is a grain and fruit eater, and will need to be watched in the neighbourhood of orchards.

Though so common, its history is feebly reported. The species of Eastern Australia is a common and destructive bird from the fruit-grower's point of view. Being similar in many respects to this species, its life history in many ways will agree. In writing of the Eastern bird (*P. eximius*, Shaw) I have elsewhere written:—"It is quite numerous at times, and very destructive among large fruit, as apples and pears. The trouble commences soon after the young begin to forage and continues through the summer, or as long as any fruit remains upon the trees or ground. The hotter the day the more persistent the invaders, as if more moisture was necessary for them. During the winter and spring it gathers a living in the fields. The young birds appear in our markets as early as the middle of November."

It is interesting to note what education will do for a Rosella. I know of one, aged 21 months, that is able to speak 36 phrases, words of exclamation and sentences of six words. Twenty-three of these I put on paper. It reminded me of Humboldt's story of the South American venerable parrot, which was the sole possessor of a literally dead language, the whole tribe of Indians having become extinct.

Nest.—Hollow of a tree containing decayed wood, upon which the eggs are placed.

Eggs.—Five to seven for a sitting; white. Length, 1 inch; breadth, 0·8 inch.

PURPLE-CROWNED LORIKEET.

Glossopsittacus porphyrocephalus, Dietr.; (*Glo-sop-sit'a-kus, por'fi-ro-sef'a-lus.*

Glossa, tongue; *pittakos*, a parrot; *porphura*, purple; *kephale*, head.

Trichoglossus porphyrocephalus, Gould, "Birds of Australia," fol., vol. v., pl. 53.; "Key to Birds of Australia." Hall, p. 61 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas, 9, 7, 6.

KEY TO THE SPECIES.—General colour, green; crown purple; ear coverts yellow mixed with red; no red in cheeks; first primary equal to or a little shorter than second and third.

Without sufficient data, one cannot well say which parrot is most destructive in orchards.

Certainly this bird will rank well up in the list of nuisances. It appeals to me as being plentiful between the Swan River and the Stirling Range and West of the latter, and is partial to the "gums" well laden with blossoms rich in sweets.

For this purpose it is said the brush tongue has been provided. The anatomy of the point of this unruly member is a debated question. It is thought the brush is made of tubes that convey the blossom-honey from the calyx to the mouth.

Dr. Garrod holds the opinion that it is only an excessive development of the papillæ which are always found on the lingual surface. It travels in large flocks great distances, and may be found along the whole Southern portion of Australia.

Nest.—The decayed wood in a hollow of a large tree, mostly a eucalypt.

Eggs.—Four to a clutch; dull white; roundish; length, 0·8 inch; breadth, 0·7 inch.

RED-COLLARED LORRIKEET.

Trichoglossus rubritorques, V. and H. (Trik-o-glos'us, ro-bri-tor'kwez).

Trich, hair; *glossa*, tongue; *rubricus*, red; *torques*, collar.

Trichoglossus rubritorques, Gould, "Birds of Australia," fol., vol. v., pl. 49; "Key to the Birds of Australia," Hall, p. 60 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 8, 1.

KEY TO THE SPECIES.—Head blue, chest red, abdomen olive green; band on nape orange; tongue brushy; bill longer than deep; under mandible with gonys nearly straight.

This species is confined to the Western portion of the continent, and particularly to the Northern part of it. Along the

Eastern coast is an allied species (*Tnovæ-holl indiæ*), and so closely do they resemble one another in habits that a description of one's most prominent customs will apply to the other. In writing of the latter bird, Mr. Gould says:—"The incessant din produced by their thousand voices (referring to two species together) and the screaming notes they emit when a flock of either species simultaneously leave the trees for some other part of the forest, is not easily described, and must be seen and heard to be fully comprehended. So intent are they for some time after sunrise upon extracting their honey food that they are not easily alarmed or made to quit the trees upon which they are feeding. The report of a gun beneath them has no other effect than to elicit an extra scream or cause them to move to a neighbouring bough, where they again commence feeding with avidity, creeping among the leaves and clinging beneath the branches in every variety of position."

Its flight is extremely rapid. Blossoms well provided with nectar serve as the principal food.

Nest.—A bare hollow in a large eucalypt tree.

Eggs.—Clutch two: roundish oval in shape; colour originally white, but stained with the wood dust later. Dimensions—(1) 1·11 inches x 0·87 inch; (2) 1·05 inches x 1·03 inches.—(A. J. Campbell.)

WHITE COCKATOO (Sulphur-crested Cockatoo).

Cacatua galerita, Lath. (Kak-a-tu'a gal-e-ri'ta).

Kakatua (Malay), imitation of the cry; *galerum*, a helmet.

Cacatua galerita, Gould, "Birds of Australia," fol., vol. v., p. 1.; "Key to Birds of Australia," Hall, p. 62 (1899).

GEOGRAPHICAL DISTRIBUTION.—The whole continent.

KEY TO THE SPECIES.—Body feathers white; crest yellow, the feathers being narrow and recurved; cere naked; skin round the eyes white.

This is one of the several species of cockatoos that are nearly white; and it is the whitest.

That celebrated ornithologist, the late Mr. John Gould, remarked upon the want of affection shown by the farmers to this bird. He says:—"As may be readily imagined, this bird is not regarded with favour by the agriculturists, upon whose fields of newly-sown grain and ripening maize it commits the greatest devastation; it is consequently hunted and shot down wherever it is found, a circumstance which tends much to lessen its numbers. It evinces a decided preference for the open plains and cleared lands rather than for the dense brushes near the coast; and, except when feeding or reposing on the trees after a repast, the presence of a flock, which sometimes amounts to thousands, is certain to be indicated by their screeching notes, the discordance of which may be easily conceived by those who have heard the peculiarly loud, piercing, grating scream of the bird in captivity, always remembering the immense increase of the din occasioned by the large numbers of birds emitting their harsh notes at the same moment."

In the heavy foliage and deep shadows the cockatoos certainly sport "like spirits of light," but they seem to act like spirits of darkness in the wheat field.

The food is seeds, grain, and bulbs.

Nest.—A hollow at a high altitude in a large eucalypt is used, and the eggs hatch out on the dry dust.

Eggs.—Two for a sitting; white. Length, 1·5 inches; breadth, 1·2 inches.

For no moment must it be thought that all cockatoos are harmful. The black-plumaged section has no blot against its name. Rather has it a good one. Take a case of *C. funereus,* found in the Eastern States. Although I cannot quote long reports in connection with our own species, I know they are very useful in the same way. *C. funereus* is in many respects similar in form and habit to our birds. I have seen great trees almost denuded of their bark by the attacks of the birds of this species upon them in search of grubs. The absence of woodpeckers *(*Picidæ*) in Australia is partly substituted by this bird, for in all other forest-bearing countries the woodpecker family of birds is the natural enemy of wood-eating larvæ. As orchards open out in the Eastern part of our State this bird will play its *rôle* very nicely if left alone, for the time may come when longicorn and other beetle larvæ will bring trouble to the trees introduced for profit. The tap-tap of the woodpecker is not so disastrous to the tree as the "bark wrencher" of the cockatoo. A *nom de plume* writer in an old paper speaks of a great mass of timber levelled in the area between the Latrobe and Tanjil Rivers in Victoria, in order to oust a horde of hungry grubs. The whole country beyond the Baw Baws seems at times to be blockaded by these birds. Great scars in the trees assume the V shape, some two inches deep, and young and old very quickly disfigure a part of a forest in search of the juicy grubs. The one-year-old bird is not nearly as expert as the warrior of maturer years, for while he thinks and hesitates the latter knows his business, and proceeds to dislodge the enemy upon a slender indication. *C. funereus* is the Eastern representative of our *C. baudini, Vig, White-tailed Black Cockatoo,* which is found in no other part of the world than the South-West of our State.

The food of the Ngol-ye-nuk, as the Aborigines used to call the latter bird, is insects and seeds upon the ground and grubs and seeds upon the trees. The grub of the Goat Moth (which is a timber-destroying larvæ) is as much appreciated apparently as by the Roman epicure, the bushman or the aborigine. The present writer has toasted and eaten the tasty bardee with a certain kind of relish.

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* We have tree-creepers, not wood-peckers.

The heavy and sober flight of two or more impresses one. They nest during September and October in the heavy forest and choose a large dead tree, in which a hollow serves them as a nest. Morning and evening they screech, and the vastness of the forest does not seem offended. A little block is out of keeping with a Black Cockatoo.

A second species is *C. stellatus, Wagl.* (*c. naso*, Gould). It is known as the Western Black Cockatoo, because of its restriction to the West of the continent. Upon the tail is a red-band, and in length it is 22 inches. It appears to associate in number, and is not so solitary as the species just mentioned. This also is found in the heavy, moist timber of the State.

Both use hollows of goliath eucalypt trees in which to nest, and each lays two white eggs about 1·5 inches in length.

FRUIT-DRYING.

Now that the fruit season is at its height, much which should never be put on the market to compete with the higher-grade produce could with profit be disposed of as dried fruit.

It is not meant to infer that a high-class dried fruit can be manufactured out of an inferior sample, but rather that it may be more profitable to convert such produce into a more readily saleable article.

It may also happen that in the glutted market in the midst of the season even first-class fruits cannot be sold at a profit, and it then may be advantageous to hold them back and prepare them into some other commercial form.

Drying affords a cheap-and-ready way of converting into a commercial commodity (which may be stored and disposed of to the best advantage in due season) such quickly perishable products as ripe fruits.

To those situated in remote localities beyond easy distance of markets or of the highways leading thereto, drying also offers a convenient way of utilising their bulky and perishable crops.

Observation, experience, and such education as is conveyed by the mistakes of others have resulted in a variety of methods and practices being adopted when drying different fruits. The principles which underlie these methods are the same, but local convenience, the cheapening of the handling, and the ultimate appearance and commercial value of the products turned out have been the main causes of such modifications as the treatment of each kind of fruit suggests.

RAISINS

is the name given grapes dried in the sun or by artificial evaporation. During that process the berries loose about two thirds of their weight, owing to the evaporation of the water they contain.

Three types of raisins are manufactured, each type being further sub-divided into grades, viz.:—

I.—CORINTH RAISINS.

Raisins dried from wine grapes. This industry is an important one in parts of Greece, Turkey, and some of the Mediterranean islands. The product is exported to France, Germany, and England where it is turned into white wine, either consumed as such or distilled into brandy.

These raisins are made from grapes picked when fully ripe. They are or are not dipped in lye and when sufficiently dry after exposure to the sun, they are run through the winnower to separate the stalks from the berries and are packed in 1 and 2cwt. sacks or in barrels. When opened, the contents of these sacks are so crushed together that they form but one mass. This class of raisins sells f.o.b. from 10s. to 18s. per cwt.

II.—PUDDING RAISINS OR LEXIAS.

The bulk of the raisins are of this class. The name *Lexia* (L. *Lixivium*) they owe to the fact that unlike Table Raisins they are dipped in a lye. The grapes used in the manufacture of these raisins are the Muscatel Gordo Blanco, the Muscat of Alexandria, the Seedless Sultana and the Currants.

Picking.—The grapes should never be picked for drying before they are dead ripe.

The currant crop is ready for picking a fortnight before the Muscats, and the same trays answer for drying both crops, so that the advantage of growing them together is evident.

There are several ways of ascertaining whether the crop is fully ripe:—

(1.) By the colour, which, in the case of the Muscatel Gordo Blanco, should be a bright amber, and also by the taste. (2.) By the saccharometer, which gives more accurate indications, as a bunch grown in the shade may be ripe and yet colourless. It is reckoned that the juice of the grape should contain at least 25 per cent. of grape sugar to produce a good raisin.

Pieces of stalks, dead leaves, and imperfectly ripe berries, which would dry brown instead of a bright colour, are removed.

Dipping.—The ripe grapes are usually packed in osier baskets. The baskets should not be piled on the top of each other, nor should their contents be dumped on to the ground. They are brought to the dipping tank and draining terrace where the grapes are placed in galvanised iron baskets or sieves; at least two such baskets are required, which are lowered into the dip and filled alternately. The lye tank may consist of any convenient open boiler, such as a washing boiler, or even a 200 or 400 gallon square iron tank cut in half and set in mortar over a fireplace.

The strength of the lye used varies. The stronger the lye the shorter the time the fruit is dipped.

In Spain and the Mediterranean raisin-producing countries, the lye used is made from the ashes which are got from the vine prunings; to these a proportion of powdered quicklime varying from one-fifth to one-fourth is added, and the mixture passed through a sieve. To this water is added in proportion shown by practice; the liquid is heated and preserved in air-tight vessels.

A more accurate method of preparing the lye consists in using alkalies of known strength in solution in water. Thus, 1lb. caustic potash or caustic soda to 15 gallons of water is often used, although some make a stronger lye and only add to 1lb. of the alkali 7 to 8 gallons of water, claiming that fruit quickly dipped retains a brighter colour when dried.

The strength of the lye having been settled, the solution is brought nearly to the boil, and all scum floating on the surface is skimmed off. Some of the least ripe grapes are then dipped for two or three seconds into the boiling liquid, and the result of the dip ascertained a few minutes later. The object of dipping is to make the drying process more active by dissolving or saponifying the waxy covering which constitutes the bloom, and opening up the pores on the skin, thereby allowing the quicker evaporation of the juices of the fruit. If as a result of the test on these more tender berries numerous small holes like pin-pricks show, the length of the dipping is sufficient, whilst, on the other hand, should the skin show cracks and slits, the time of immersion of the fruit in the lye should be shortened, or the strength of the lye itself should be reduced by means of a further addition of pure water.

The minimum time for dipping is two seconds, and the maximum 18 seconds. Thickness of skin, stage of ripeness of skin, abundance of waxy bloom, and strength of the lye all govern the length of dipping, and this, as has been explained, can be adjusted by means of personal tests.

Rinsing.—After dipping, the galvanised iron baskets are allowed to drain for a minute or so, and are then plunged into clean, cold water, and emptied on wooden trays to dry. Some do not rinse the fruit, and claim that the colour is then brighter.

Sulphuring.—After dipping and before drying, the fruit is often exposed to the bleaching action of sulphur fumes in order to obtain a bright amber-coloured sample. Trade requires this colour, and the process has little or nothing else to recommend it as the fruit is often over-sulphured and is rendered acid, heavy to digest, and much of the peculiar fruity aroma inherent to the fruit is more or less destroyed.

The extent of the sulphuring cannot be determined by any hard and fast rule, and must be adjusted by practice; but it is necessary that the several charges in the bleaching chamber should be exposed to the same amount of sulphuring, otherwise an uneven sample would result, and the value of the article would thereby be greatly affected.

Small sulphuring chambers may consist of boxes in which the trays are stacked while the operation is going on, or of a larger chamber into which trollies laden with the fruit trays are wheeled and taken out again to make room for a fresh load. A box slightly larger than the trays, and which can be hermetically closed and provided with doors of the full size of the front, constitutes a simple sulphuring chamber; on the sides cleats are nailed, upon which the trays laden with fruit are rested tier upon tier. Some push the bottom tray so that there is a little room at the back, whilst the next tray is pushed a little farther, so that the interval should be at the front, and so on until the last tray is put in. This arrangement favours the even distribution of the sulphur fumes, which are generated in a roaster set outside the box, with which it is in communication by means of a flue. A simple hole dug into the ground, and covered with an oil drum with a tin tube connecting it with the sulphuring box, will answer. The sulphur is set alight, the fumes allowed to enter the box, which has a hole at the top which can be either left open or shut by means of a sliding damper. When the fumes begin to issue from the box at the top, the damper is closed, and the fruit is allowed to remain for a few minutes immersed in the bleaching fumes.

Drying.—This is effected either through direct exposure to the rays of the sun, or where the sun's rays are not potent enough, through the artificial heat of specially-constructed kilns.

At times the grapes are first half dried in the sun, and finished off in the kiln.

In Western Australia, where a dry, sunny autumn may be relied upon with a fair amount of certainty, grapes, apricots, prunes, and such like fruit can be sun-dried without trouble, and without entailing the extra cost of kiln drying.

Late-picked fruit, however, especially in the cooler districts o the State, might, in particularly early rainy seasons, be damaged when sun-dried; but, as a rule, all fruit ripening not later than the end of March may with safety be sun-dried.

Around Malaga and the other famous raisin-producing districts of Spain, the raisins are exposed to dry on drying terraces, built at an angle, facing the hot south. These terraces consist of brick-wall quadrangles, filled in with earth, over which is spread several inches of clean small gravel, on which the grapes are laid; on these they dry evenly, whereas if laid on the bare hard earth, one side is often dry, whilst the other remains moist.

The drying ground is, however, cumbersome and antiquated, and can with advantage be superseded by the drying tray. These trays are made of different sizes, but for the sake of convenient handling, trays 36 inches long and 24 inches wide are to be recommended.

They are either made of four 6in. matchboards, 3ft. long, held together by nailing head pieces of 2½in. x 1in. and 2ft. long at each end, or instead of matchboards, on which in damp weather the fruit mildews more than on lath trays, or of broad Oregon laths, set close, side by side, and which allow a free circulation of air. On the upper side a ¾in. rim is nailed all round the tray, and keeps the fruit from slipping off when turning it.

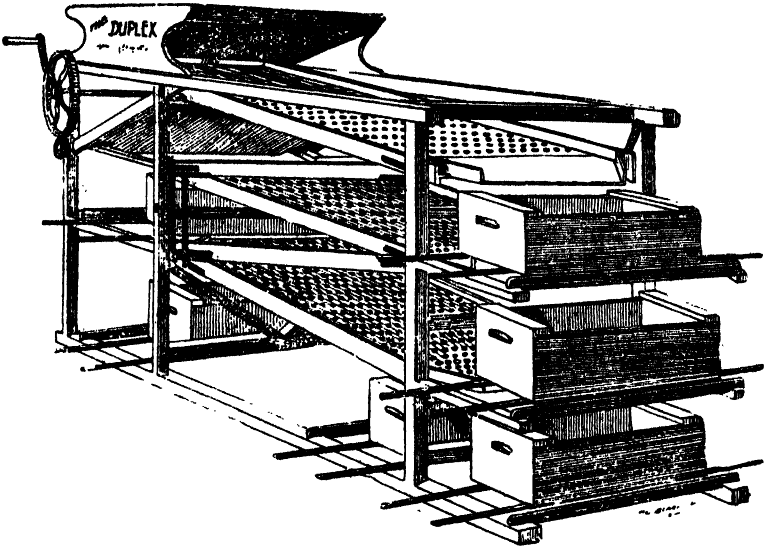
Over these trays the fruit is placed and exposed to the sun. When half dry they are turned. This is done by placing an empty tray upside down over the first tray to be turned, and swinging the lot over. The tray which had the fruit is then empty and ready for use in turning over the next tray in the row, and so on until they have all been turned over.

If grapes or other fruit get wet whilst drying, they turn dark-brown, and are discoloured, and to prevent this, in case of rain or heavy dew at night, the trays are piled over one another to a height of three or four feet, and securely covered with a tarpaulin or roofing iron. When thus stacked, the thickness of the end cross-pieces prevents the fruit from getting crushed. After turning, the drying will proceed more rapidly, and the raisins should be watched to prevent them from becoming too dry.

When sufficiently dry the raisins are removed from the trays. A ready method of ascertaining whether the berries are ready to be removed is to pick up a few and roll them gently between the finger and thumb. If a drop of liquid exudes at the stem end, the raisins require further drying, but if jelly only shows, the raisins are dry enough.

Stemming.—The next process consists in removing the stalks. These will be brittle if the raisins are taken up towards the afternoon, and will then break off easily. This can easily be done over a ¼-in. sieve, which will also let through some of the rubbish.

Winnowing.—This done, and before the stalks get limp, the loose berries are run through a winnowing machine, which separates a greater portion of the stalks and grades them in sizes.



Winnowing Grape Machine.

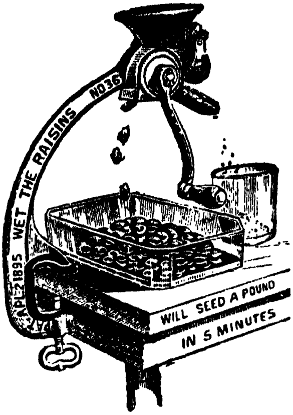
Sweat Box.—The fruit must then be sweated for a fortnight or so before being packed and put away. Sweating is an operation which all dried fruit must undergo.

If the raisins on the trays are examined, some of them will be found dry enough, while some may be too dry and some not sufficiently cured. At this stage the sweat-box is found useful for equalising the sample and making the stems tough and ready for packing. The sweat-boxes are 8in. to 9in. deep and contain about 1cwt. of raisins. The boxes are only about two-thirds filled with raisins, and they should be stirred about every now and again until sufficiently dried. They may be used for carrying grapes from the vineyard and other purposes.

In transferring the contents of the trays into the sweat-box, the raisins are slid off in the same position as when they lay on the tray; to prevent the stems getting entangled, two sheets of paper of the size of the box are put in at intervals, as the box is being filled. The sorters have two or three sweat-boxes, and grade the raisins into first, second, and third quality.

Packing.—When the sweat-boxes are full, they are put away, one on the top of another, for ten to twelve days, to sweat, after which they are taken to the packing room, which is provided with tables, scales, presses, and neat boxes of different sizes, holding 5lb., 10lb., 15lb., and 20lb., in layers of 5lb. each.

They are then placed in proper boxes and pressed hard by means of a lever or screw press, so as to set them well in a mass, and exclude insects which prey upon dried fruit.



Raisin Seeder.

Seedless Raisins

are the produce of the currant vines, the Sultana vines, or small and imperfectly developed muscatel grapes, which now and then are found on muscatel bunches. When dried, these small raisins are separated in the grader, and sold as "seedless muscatels." For cooking purposes, seedless raisins are in better demand than the seeded lexias or pudding muscatels, and in order to meet the demand for that class of article, small and inexpensive raisin seeders are sold for a few shillings, which can be clamped to the corner of the kitchen or pantry table and neatly extract the seeds from the raisins.

Table Raisins.

The drying of Table Raisins and currants is effected much after the fashion of pudding raisins, with the difference that they do not undergo the dipping process, which would spoil the appearance and remove the bloom.

Great care should be taken in picking not to remove the bloom, which would spoil the appearance of the raisin. For that reason the bunch is handled by the stem, cut with a sharp knife, all imperfect berries, pieces of stalk, dead leaves removed, and then placed upon either shallow baskets or directly upon the trays right side up, *i.e.*, the side showing less of the stem. In large vineyards there is economy in placing the trays between the rows of vines and covering them at once with grapes, whereas on a small vineyard it may be convenient to take them all to the kiln or to the drying terrace.

The finest bunches having been carefully picked, as described, they are simply put on wooden trays, made 2ft. wide and 3ft. long. If too large, they are not so convenient to handle when filled. Each tray receives from 20lb. to 30lb. of grapes, which should produce 6lb. to 10lb. of raisins, after having been put out in the sun or in the kiln to dry.

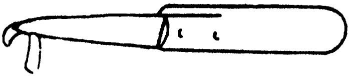
Upon the state of the weather, and the size and degree of ripeness of the berries, will the time required for drying depend. Rapid drying gives a hard and tough raisin, and should be avoided. At the end of eight to 14 days, according to circumstances, the grapes being about two-thirds dry, are turned, by placing an empty tray, as already described, on the top of a full one, and turning them over. After turning, the drying will proceed more rapidly, and the raisins should be watched, to prevent them from becoming too dry.

The packing of table raisins is of paramount importance, as appearance considerably enhances the value. The flat boxes are artistically got up, and carefully lined with lace paper. Nice clusters of bunches of the same grade as the contents of the box are either flattened between the fingers, or by passing through rollers and placed at the bottom of the box, which is then filled with as many grapes as it will hold, the lid is then placed on the top, and nailed down after pressure has been applied. The box is then turned upside down, and so labelled that what was the bottom now opens top. Facing plates are also used for the same purpose. It consists of a brass plate of the size of a box. In this plate are rows of small cup-like cavities, into each one of which a flattened raisin is set and lightly pressed, and loose raisins are carefully filled in on the top. After pressing, it is found that this top layer has retained its arrangement and is regularly faced.

Apricots and Peaches

should be picked when fully ripe, but not overripe. The fruit should not be so soft as to be mushy. The picking is often done by shaking the tree over spread canvas, but the better class of fruit is picked by hand. The fruit should be cut clean round, and the parts not torn apart. They are placed on the tray cut side uppermost, and should be taken to the sulphur room within an hour of being pitted. It is estimated that in properly made sulphur rooms three to five pounds of sulphur per ton of fruit are sufficient for bleaching. About three to four hours are long enough to keep fruit in sulphur fumes; when the skin, unlike the pulp, is not bleached, the fruit curls up and looks small. About three or four days of sun-drying will be sufficient. The fruit should not be dried hard enough to rattle on the trays. The proper stage is determined by handling the fruit, which should be soft and pliable to the touch, but not sticky. After sweating, the fruit is graded and packed. A layer of fruit, flattened between the fingers or run through a clothes wringer, is placed at the bottom, cup-side down, the box is well filled, and pressure is applied. When the box is taken up and dressed, it is so done that, when opening, what was the bottom becomes top.

Peaches are dried either peeled or unpeeled. A paring knife is used for peeling, and the knife for pitting Clingstone peaches.



Knife for Pitting Clingstone Peaches.—*Wickson*

The pit of Clingstone peaches is best removed with a knife, known as the Tarlton knife, such as is represented in the accompanying figure. Such a knife consists of a strong blade, with a short U-shaped blade set at the point. Unlike the spoon-shaped knife, which can only be used on soft fruit, it answers for both soft or quite firm fruit.

It takes 5lbs. of apricots, 4 or 5lbs. of dry fleshed peaches, and 5 to 7lbs. of more juicy peaches to 1lb. of dried fruit.

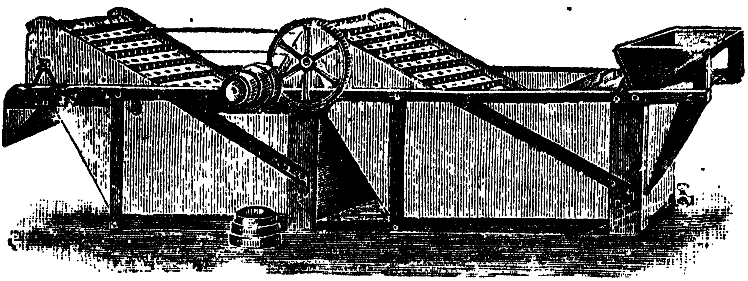
Prunes and Plums.

Plums are dried for stewing, they are cut open and pitted. Prunes are dried with the stone. Being a fruit of firm texture and not easily bruised, the labour of hand-picking is generally dispensed with.

The fruit is allowed to hang until dead ripe and they fall from the trees, when these are lightly shaken; the last of the crop has to be gathered by hand, and is generally used for a second quality.

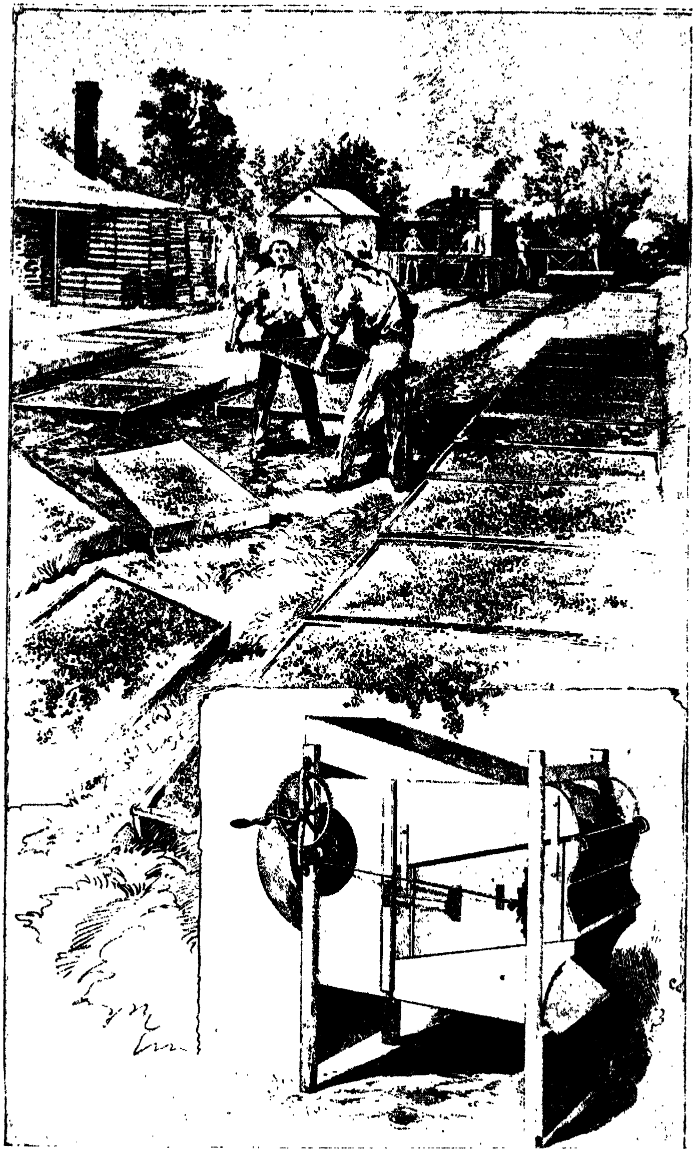
They are graded before drying either in some home-made grader, consisting of a long chute with three different sizes of wire screen on it, or they run through some grading machines of which several patterns are used. Unless properly graded, of the one size for each tray, they dry unevenly, some being over-dried and others not dried enough. They are then dipped, as explained above, for 20 to 30 seconds. If the lye takes off the skin, shorten the time of dipping by a few seconds. We are indebted to the New South Wales *Agricultural Journal* for the illustration on the opposite page, showing the drying trays and raisin grader.

Sometimes dipping is dispensed with, and the fruit dried with the bloom on; the operation then takes longer.



Fruit Dipper.

An ingenious contrivance for dipping is shown in the illustration. The fruit is fed evenly to the machine, and after dipping is carried over to an adjoining fresh-water tank, where it is rinsed and delivered on to the trays without handling. They are then exposed to the sun, when, according to the weather and location, it takes seven to 14 days to dry. If kiln-dried the operation is



Raisin drying in Australia and showing Raisin Grader.

done in as many hours. The operation being done in three successive periods. The first two gradually dry the fruit, the last finishes the work and puts the gloss on.

The first "cooking" is at a temperature of 113° F. to 122° (45° C. to 50°.) After each cooking the prunes are simply rolled over the trays without handling the fruit. When cold, the trays are returned to the oven or evaporator and exposed to a temperature of 140° F. to 160° (60° C. to 71°), and in the third cooking to a temperature of 176° F. to 194 (80° C. to 90°) or even slightly higher.

Careful watching is required during the third heating to guard against the puffing and burning of the fruit. Table prunes receive the "glossing" by exposing the fruit, dipping in hot syrup or in hot water with a small amount of glycerine added (1lb. to 20 gallons). This hot dip also kills insect's eggs. After the fruit has sufficiently dried from this dipping, it is packed in boxes or jars and pressed. Three lbs. of fresh prunes made one of dry. The price is regulated according to size, which range from 40, 50, 60, and up to 100 to the pound.

APPLES AND PEARS

should be more heavily sulphured than other fruit, and dried as soon as pared and quartered. A better device is to cut the apples into rings with an apple parer. This machine also takes out the core, which boiled down with the skins makes a jelly. A light-coloured article is preferred by the trade. Of Bartlett pears 5·8lb. yield 2lb. of dried fruit.

FIGS

are picked when quite ripe, and when they commence to shrivel the stalk should be left on them. They do not dry very evenly, and after exposure to the sun for six to ten days, during which they are turned once, the dry ones are removed, and those not yet ready, allowed to remain a little longer.

Black figs are not sulphured, whereas white ones are improved in colour by bleaching. If too syrupy inside, and when the juice oozes at the eye, as occurs with some varieties, the eye is slightly raised for a day or two until the juice thickens. Figs should not be dried too hard. After coming out of the sweating boxes, after 10 to 12 days and before packing, they are softened by dipping into boiling brine or hot syrup. When sufficiently dry, those which open on the top of the boxes are drawn between the fingers and flattened. Pressure is applied to keep out insects and prevent the fruit drying excessively. Three to four lbs. of ripe figs yield one of dry.

REPORT OF BEE INSPECTOR.

By J. Sutton.

I have the honour to report having visited the district from Brunswick to Busselton, and inspected the following apiaries:—

Australind.—Mr. Joseph F. B. Clifton has 21 colonies, all in frame hives, and fairly clean, as the bees are fairly well sprinkled with Italian blood. A few of the blacks have indications that the moth had been at work, but these had been cleaned out and were healthy. About half a ton of honey was quite ready for extracting, principally from jarrah and banksia blossom. The position is fairly good, and could carry with profit about 50 colonies, which ought to do well if attention were given them.

Picton.—Mr. Rose, of Moorlands, has 27 colonies, all in frame hives; a few Italians, but the bulk are pure black bees. The old combs are badly riddled and moth-eaten, but this is more from want of attention and a practical knowledge of working than anything else. With a few exceptions, these were late swarms. Every hive was full of honey, ready for extracting. The position is good, and if attention were given bees would do well. These bees stand in a vineyard, and looking round the same I pointed out that, were the same attention given to the bees as to the vines, they would be not only profitable but also a pleasure, instead of causing so much trouble with excessive swarming.

Mrs. Stinton.—Here I expected to find trouble, but was agreeably surprised to find that the few bees remaining were clear of foul brood. There are two colonies in frame hives and three in old boxes, the latter falling to pieces and a complete wreck from white ants and moth. Several old boxes were lying about full of rubbish and moth worms. Instructions were given to transfer bees out of old boxes, have the wax melted up, and old boxes burned without delay. This was at one time the largest apiary in the State, as the old lady said she had sold, in good seasons, £30 worth of honey, but want of attention, and disease and moth, had brought the whole to a complete wreck.

Mrs. John Ayers, South Bunbury, has 21 colonies of mixed bees, in frame hives. Being late, I could not inspect, but from outward indications I was satisfied they were in working condition and in fair order. Mr. Ayers thinks that there is foul brood somewhere in the district, but he has not been able to locate it. He has had indications of its existence in his own apiary, but as prompt attention had been given, it was kept in check. £30 worth of honey had been taken up to date.

Boyanup.—Mr. Riley has 17 colonies in frame hives, including one or two Italians, which are fairly clear of moth; but amongst the black bees moths are in evidence in the old combs.

Mr. Fowler has seven colonies, all black bees, but they are all left to run wild, and I could only inspect some in box hives; the others were in very bad order, and the moth undisturbed. I not only gave instructions, but also gave them practical lessons how to treat them.

Mr. Simmons has six stocks, each in old box hives. Three were in a very bad condition, with old comb broken down, and the moth wandering at its own sweet will. Mrs. Simmons did not appreciate my interference, and waxed warm with respect to the Government, especially their inspectors. After informing her that the chief desire of the Government was to render assistance and information, I pointed out that regulations must be enforced where people failed to take proper measures to keep their bees free from moth and contagious diseases.

Mr. J. M. Whistler has three frame hives, all black bees, but which, through lack of attention, were in poor condition. He has a beautiful place, his orchard and vineyard being in splendid condition; and I pointed out that had the same attention been paid to bees the results would have been much more gratifying.

At the earnest request of the chairman and committee of the local Association to give a lecture on bees, I acceded to their request on the Friday evening. The meeting was well attended, and the interest in the subject is such in the neighbourhood that I have no doubt that good will result from the evening's discussion. Questions were asked and answered, and the same question was put to me as when I was at Donnybrook and Bridgetown, viz.: "Was it the intention of the Department to issue instructions, in pamphlet form, with respect to bees, as had been done for fruit-growers?" My reply was that up to the present there had been no demand for such, but that I had no doubt, should the demand from those interested be made known, something in that direction would have the careful consideration of the Department.

Busselton.—Here I found only one who had bees in a box hive; others had succumbed to the ravages of the moth. Several settlers were very desirous that at a later date I should return and give them a lecture on bees and the best method of dealing with them, as they felt that every farmer should keep a few hives.

Messrs. Pries Bros. have a beautiful place some five miles out of town, and have 105 colonies of bees, mostly the black strain. They imported a few of the Italian strain from the Eastern States, but the conditions under which they had worked their bees placed them in an unfavourable position to keep the Italian. However, after looking through them and tendering my advice, they could see that there were greater possibilities and profits from bees than they had ever dreamt of, and as soon as harvesting was under control they would act on my advice and try results. They had had much trouble with the moth amongst the old black strain, but the infusion of the little Italian blood had considerably relieved them.

HARVEY.—Mr. Carmen Clifton has 11 colonies at Wokalup Hoolie, consisting of Italians and blacks. The difference in favour of the Italians satisfied him that he must keep the black strain under and Italianise them all, which he is going to do this season. He has had a lot of trouble with the blacks and the moths in the past.

Mr. W. Logue, I found, was distant miles in the ranges—a real good position, and a good honey flow. He has, all told, 18 colonies, mostly in frame hives; but owing to being unable to obtain the necessary hives, had placed the late swarms into any boxes he could get at the time. Mr. Logue's bees are on a par with most others, but for want of attention, in removing the honey to give them room, and keep them in a state of activity, swarming was the result.

In almost every instance I find instead of inspection the people at present want instruction. This I freely gave, and an object lesson whenever such was possible, which in each case was gladly received.

Several other hives I heard of, but as they are a long way off the railway track, and could only be reached by driving or on horseback, they will be inspected later.

BOX v. MODERN FRAME HIVES.

By J. SUTTON.

In these days of rush and tear, it is astonishing how persistently the old settlers adhere to the old box hives, seeing that they have not any control over the inmates; whether there is a young or an old queen, or indeed any queen at all, does not seem to trouble them. All they think about is that they have some bees, and if at the end of the season they can procure a little honey, is about the only thing that exercises their minds. Often they are left severely alone, year in and year out, until the box becomes clogged with old comb, which is then only a receptacle for the wax moth or some disease that spreads death and destruction, not only to themselves, but to all that are within the district.

A little honey may be removed at the end of the season, and the bees are left to make the best they can of the position; perhaps not being able to store sufficient nectar to keep them alive during the winter months, when they die. Or, if they survive, it is only in a weak condition, and it is then the moth takes possession and drives the remainder out of their home.

Place the smallest swarm of bees into a modern frame hive, say, in the month of September. See that it is properly fitted with frames, having full sheets of comb foundation, and with very little attention this swarm will not only live but will build up, and *(giving a fair season) will give a surplus of honey at the end of the season. For illustration, we will suppose that there is a surplus of 30lbs.* See that they have plenty of spare stores to carry them through the winter, and, providing the queen is good and prolific, by the month of September they will be ready to swarm. But, if a super is given them, taking those frames that contain honey out of the brood nest and placing those in the super, and replacing these with empty combs, or frames with full sheets of foundation, it is just possible they may settle down and go through the season without swarming at all; and if left alone until the end of the season, instead of giving 30lbs., they would more likely give 60lbs. to 80lbs., and with a little attention, say once a month, look at the super, and if full remove, and give an empty one in place. This same colony may give for the season from 100lbs. to 150lbs. of surplus honey; and while giving this amount of honey, the bees would be in a better and healthier condition, more docile, and easier to handle—in a word, would be a pleasure instead of a nuisance to their owner.

But should they swarm, it becomes the duty of the owner to see that the bees that are left have proper attention; *i.e.*, examine the frames, and they will be found to contain a number of queen cells. These should be removed at once, except one single cell, and this should be the largest one found. This will prevent what are called after swarms, and in about two weeks there should be found a young queen laying, and should need but little further attention.

Providing the swarm that came out is found, this should be placed in another hive, when, providing it is furnished with frames and foundation as above, they should settle down and be no further trouble for the season.

Compare these results with the old box hives, and I feel assured that the old box must give place to the modern hive.

WEST AUSTRALIAN BEEKEEPERS' ASSOCIATION.

Report of meeting held December 14, 1902, in the museum of the Department of Agriculture, Perth. Present: J. N. Shipton (president), J. Sutton, W. O. Hipewell, W. Masterton, R. Taylor, J. B. Kline, and W. Potter (hon. secretary).

The minutes of the previous meeting were read and confirmed.

The only correspondence read were communications from the Agent General and the British Honey Company, in reference to the export of honey to England, and as the general tone showed that only a low price was to be expected for our products there, and as the local markets are not nearly stocked with the local honey, the time had not arrived when we will require to seriously consider the export business; but when we have a substantial surplus no doubt some power may be brought to bear that will break down the prejudice which exists in England, the same as has been done with other Australian products.

It was considered best that the papers be held over *sine die.*

The secretary was instructed to enter into communication with the Department of Agriculture asking for their co-operation in obtaining the necessary information as to the most suitable class of buildings to be erected at the agricultural show grounds for the use of apiarists; also to obtain plans and all particulars of same. Several prominent beekeeping centres in the Eastern States were mentioned as being the most likely places to obtain the desired information.

The secretary and president were empowered to draw up and cause to be circulated a circular drawing attention to various items of interest to the association, also inviting all persons interested to be present at the meeting, to be held the second Wednesday in each month. It was also considered that, to make meetings more interesting, members should bring or forward exhibits of anything of interest in connection with the work, together with some report on the same; and also that anything new may be discussed, and if anyone did not quite understand anything peculiar they would thereby be benefited by an exchange of opinions.

The following is a copy of the circular referred to, and which has been sent out to beekeepers:—

WEST AUSTRALIAN BEEKEEPERS' ASSOCIATION,

Goldsworthy Road, Claremont,
24th December, 1902.

DEAR SIR,—Your attention is drawn to a resolution passed at the meeting of the W.A.B.A. on December 10th, 1902—"That a circular be sent to all members and others interested in apiculture, inviting them to attend, regularly, the monthly meetings of the association."

At the same meeting, many important questions tending to the progress of the industry were discussed, and, as a step in the right direction, it was unanimously agreed that the meetings should be open to all interested in beekeeping, whether members of the association or not.

However, it is earnestly hoped that, to defray postage and incidental expenses, those interested will become members by paying the small fee of two shillings and sixpence per annum.

The meetings of the association will take place on the second Wednesday in each month, at the museum of the Department of Agriculture, St. George's Terrace, Perth, at 7·30 p.m.

Any member who intends to be present at a meeting is requested, if possible, to prepare some debatable question relating to beekeeping, and to bring exhibits in connection with the same.

All desirous of joining the association will please communicate with the secretary.

W. POTTER,
Hon. Sec.

Annual Returns of Fruit and Fruit Trees and Plants Imported into Western Australia during 1902.

By G. BUCHANAN.

From the appended returns it will be seen that the importations of fruit for the past year show a total increase of 17,918 cases over the preceding season, while the number of cases imported for 1901 were 35,130 in excess of the importations for 1900. It will thus be seen that the quantity of fruit shipped to this State has very nearly trebled during the past three years. An examination of the figures will show that the increased importations of apples more than accounts for the larger quantity of fruit received during the year just ended. During the year 1901, 14,252 cases of apples were received—though it should be noted that it was only during the latter half of that period that the importation of apples was permitted—while for the year just ended a total of 36,569 cases came to hand, representing an increase of 22,317 cases over the preceding season. When the fact that our last season's local crop of apples was probably the best on record is taken into consideration, it will at once be recognised that the local market for this fruit is capable of expanding as the supply increases and the product cheapens. While the local crop last season was exceptionally good, the apple crops in the Eastern States were very much below the average, so much so, indeed, that instead of contributing largely to our supply, Victoria and South Australia were under the necessity of importing their own requirements. With the return of favourable seasons, however, both these States may be expected to turn their attention to the export of apples to Western Australia, so that we may reasonably anticipate much heavier importations in the future, until such time as the local supply is capable of meeting all demands.

It will be noticed that the importation of oranges has fallen off considerably, while lemons and passion fruit also show a decrease. This condition of affairs is directly attributable to the poor crops of these fruits in New South Wales, from which State we have been principally supplied in former seasons. Owing to the drought, however, shipments of fruit from the mother State have been very light, the bulk of the citrus fruits being received from South Australia during the past season. The condition of the fruit imported, in regard to disease, has been most satisfactory during the period under review. While the severity of the inspection has not been in any degree relaxed, the percentage of diseased fruit has fallen so steadily that whereas during 1901 the number of cases condemned was 1,848 out of a total of 71,702 cases received, for the past year only 1,253 cases were condemned out of a total of 89,620 cases. These figures should conclusively prove what has always been claimed by the officers of this Department—that there is plenty of clean, sound fruit available for shipment to this State if the diseased stuff is rigorously dealt with. In the matter of disease the apple has been the principal offender, a total of 889 cases being condemned; 707 cases on account of Mussel scale, and 182 cases through being infested with Codlin moth. The latter pest also accounted for the destruction of 122 cases of pears and 23 cases of quinces. Of the citrus fruits, 115 cases of lemons and 73 cases of oranges were burnt, on account of being affected with Mussel scale. None of the diseases mentioned have, so far as is known, become established in this State, so that ample justification exists for the strict inspection which the fruit has to undergo at the ports. Without the restrictions which are in force, these diseases would not only become a menace and an expense to local producers, but the quality of the fruit imported would deteriorate, so that local producers and consumers alike would suffer.

If any argument were needed to prove that a market exists for a largely increased local fruit production, it would surely be found in the foregoing figures, which show that while the local supply is swelling in volume each year, the importations are also on the increase. A glance at the subjoined table, dealing with the importation of fruit trees, will show that the prospects of the future are not being overlooked. The importations of trees and plants show an increase of 25,707 over the former year. Leaving out of the calculation ornamental trees, small fruits, and those not particularly described, a simple reckoning will show that the trees imported during 1902 would plant an area exceeding 1,200 acres. It will be noticed that the apple still holds pride of place in the estimation of local growers as a profitable tree to plant, the quantity of apple stocks imported being nearly equal to that of all other kinds of fruits put together. While there is no reason to suppose that any difficulty will exist in finding a market for the product of all the apple orchards planted when they reach the bearing stage, it certainly looks as if other fruits are being neglected in favour of the apple, and those growers who turn their attention to growing a varied assortment of fruits instead of apples alone are not likely to regret doing so. Probably one reason why the apple is so freely planted is that it can be relied on to fruit wherever it will grow. In this respect it has a distinct advantage over apricots, plums, and cherries, which fruits are rather uncertain from a productive standpoint. Anyone who can find a locality where the cherry will fruit with the certainty and abundance which characterises it in many other parts of Australia can be sure of making a fortune. The cultivation of small fruits is another direction in which our requirements are sadly neglected. With the exception of strawberries, small fruits of local production are almost unobtainable. Gooseberries are known to thrive extremely well in the most Southerly portion of the State, but I have yet to learn what is the flavour of a West Australian raspberry, and the grower who will first put this delicious berry on the local market in quantity will, doubtless, have no reason to be dissatisfied with the achievement. As the early bird is popularly supposed to catch the worm, so the intelligent cultivator of the soil who discovers and produces commodities that are wanted, but not largely grown, obtains a better recompense for his time and trouble than his less enterprising neighbour, who is content to follow rather than attempt to lead.

Return of Fruit Trees and Plants Imported into Western Australia during 1902.

	1902. Total received.	1901. Total received.	Increase.	Decrease.
Apples	53,129	55,575	...	2.446
Almonds	916	341	575	
Apricots	3,427	1,887	1,540	
Cherries	1,356	584	772	
Figs	392	489	...	97
Lemons	1,060	415	645	
Mulberries	414	475	...	61
Oranges	22,590	15,367	7,223	
Peaches	16,417	10,445	5,972	
Pears	7,017	4,014	3,003	
Plums	6,700	2,839	3,861	
Grape Vines	...	11,750	...	11,750
Small Fruits	10,678	7,617	3,061	
Ornamental Trees and Plants	33,644	19,901	13,743	
All other Trees and Plants	3,626	3,960	...	334
Totals	161,366	134,550	40,395	14,688

Return of Fruit Imported into Western Australia during 1902.

	1902.				1901.		
	No. of cases received.	No. cases diseased.	No. cases decayed.	Total cases destroyed.	No. cases received.	Increase.	Decrease.
Apples ...	36,569	889	3,979	4,868	14,252	22,317	...
Apricots ...	100	...	2	2	140	...	40
Bananas ...	19,959	19	2,441	2,460	13,826	6,133	...
Cherries ...	2,767	...	2,233	233	3,457	...	690
Gooseberries ...	1,321	...	68	68	777	544	...
Lemons ...	7,867	115	297	412	9,803	...	1,936
Oranges ...	10,634	83	714	797	21,253	...	10,619
Passion Fruit ...	713	2	47	49	1,716	...	1,003
Pears	2,323	122	262	384	430	1,893	...
Plums	6,415	...	332	332	5,405	1,010	...
Pines	219	...	25	25	283	...	64
Peaches ...	35	...	6	6	...	35	...
Quinces ...	60	23	..	23	...	60	...
Rhubarb ...	35	...	...	...	18	17	...
All others ...	603	...	89	89	342	261	...
Totals ...	89,620	1,253	8,495	9,748	71,702	32,270	14,352

Regulations as to Introduction of Trees, Fruits, and Plants into South Australia.

The following regulations have been published by the South Australian Government, which are here reproduced for the information of nurserymen and others:—

SOUTH AUSTRALIA, to wit. } *Proclamation by His Excellency the Lieutenant-Governor of the State of South Australia and its Dependencies in the Commonwealth of Australia.*

(*L.S.*) S. J WAY.

BY virtue of the provisions of "The Vine, Fruit, and Vegetable Protection Act, 1815," I, the said Lieutenant-Governor, with the advice and consent of the Executive Council of the said State, do hereby—

1. Revoke the proclamation dated the 14th day of February, 1901, and published in the *Government Gazette* on the 7th day of March, 1901, making regulations for carrying into effect the provisions of the above-mentioned Act, and for the destruction of insects and the eradication of diseases.

2. Prohibit the introduction into South Australia of all living trees and plants of any kind whatsoever, and any portions thereof, except under and subject to the regulations in the schedule hereto.

3. Make the regulations set out in the schedule hereto for carrying into effect the provisions of the above-mentioned Act, and for the destruction in South Australia of insects and the eradication of diseases.

4. Direct that this proclamation shall be in force from and after the publication thereof in the *Government Gazette.*

THE SCHEDULE.

Regulations relating to the Introduction of Trees, Plants, and Fruits into South Australia.

1. (*a.*) The introduction into South Australia of grape vines and any portions thereof from any country or place is absolutely prohibited.

(*b.*) Living trees, plants, or portions thereof (not being grape vines or portions thereof), and fruits (not being grapes) may be introduced into South Australia from any country or place under and subject to these regulations, but not otherwise.

(*c.*) Living trees, plants, and portions thereof (not being fruit) shall (unless sent by post) only be introduced into South Australia at Port Adelaide by sea.

(*d.*) All living trees, plants, or portions thereof, intended for introduction into South Australia must, prior to being landed or introduced, be thoroughly cleansed of soil: Provided always that any inspector may admit plants growing in pots, if in his opinion there is no danger in importing them.

2. All living trees or plants, or portions thereof, or fruits introduced into South Australia from any country or place shall, on being landed or introduced, be forthwith delivered into the custody of some officer of Customs, and shall, at the expense of the importer or consignee thereof, be conveyed in original unopened packages to such place as the Commissioner shall direct.

3. An inspector shall examine such trees, plants, or portions thereof, or fruits, and may treat such trees, plants, or portions thereof, or fruits, in such manner as he may think desirable, or may order that such trees or plants, or portions thereof, or fruits, and the boxes or packages in which they were packed, or either of them, shall be destroyed by fire if, in his opinion, there is any danger in importing them.

4. The expense of conveying such trees, plants, portions thereof, or fruits to the place fixed for their examination, and of the examination and treatment or destruction thereof, shall be borne by the consignee or introducer thereof, and shall be paid before they are delivered to such consignee or introducer.

5. No person shall be entitled to any compensation by reason of any damage to or by the destruction of any tree, plant, portion thereof, or fruits, or of any box or package under these regulations.

6. No parcel of plants or portion thereof shall be introduced into South Australia unless accompanied by a declaration made by the grower, before a justice of the peace in the State or country of origin, to the following effect:—

(*a.*) That the case contains no grape vines or portions thereof.

(*b.*) That the plants were grown at a greater distance than 50yds. from any grape vines or roots of vines.

(*c.*) That no phylloxera exists or has existed in the nursery or garden in which the plants have been growing.

(*d.*) That the whole of the plants are free from the insect known as *phylloxera vastatrix.*

Given under my hand and the public seal of South Australia, at Adelaide, this seventeenth day of December, One thousand nine hundred and two.

By command,

Ag., 132/1902. J. G. JENKINS, Chief Secretary.

GOD SAVE THE KING!

SHORTHORN NOTES.

CROSSING *v.* IN-BREEDING.—SELECTION.

Many able men have devoted to these cardinal points in Shorthorn breeding the attention of competent minds. They do not all agree with one another, but the differences are not very wide. As each man sees things from a point of view which, perhaps, no other man can occupy, exact agreement is scarcely to be expected.

In the days of extreme fashion for Booth and Bates' blood, a great and unscientific bar was put to crossing as well as to selection, which must be regarded as absolutely necessary in order to keep Shorthorns as good as they are. A servile obedience to fashion often led breeders to use animals which, on their personal merits, had very insufficient claims to be accepted as sires.

Fashion has, however, done a twofold good in promoting the production of many high-class animals which were never surpassed, and in preserving the types of choice Shorthorn tribes. There was, however, for a period quite a tyranny in this fashion, and great bigotry arose among the partisans of the rival houses of Bates and Booth. All independence of individual action was, speaking generally, abandoned by the partisans, and with it the successful development of the breeder's genius. This was undoubtedly a mistaken system; one which deprived the art of breeding of its proper right and pride of place, and rendered it a mere task confined and governed by simple rules which anyone might follow.

Men of ability engaged in Shorthorn breeding, who felt compelled for several reasons to follow the fashion, must have had the discomfort of knowing that they were not breeding Shorthorns for the sake of improving them, as did the early breeders, who deserved the great name they made for themselves.

The fact that all early breeders of any distinct sorts were necessarily compelled to breed close, and that success followed their proceedings, militated against the idea that in-breeding is dangerous if judiciously practised. The general practice, however, of this course would undoubtedly result in disaster, owing to the general want of the special skill necessary to success in any business so dependent on extra skill and judgment as the breeding of domestic animals.

It has now been clearly proved that long-continued interbreeding from close consanguineous relationships is productive of evil. All must, however, acknowledge that, practically, without more or less in-breeding there can be no fixity of character, and that, on the other hand, the degree of it must be controlled by necessities which cannot be safely disregarded. Without the adoption of the principle of selection breeding becomes, to a great extent, a task which is hopeless of benefit, and it is monstrous that breeders should use bad bulls merely because they had a certain paper pedigree. The only way to keep and to increase a state of excellence is to use only the best, yet people have used inferior sires owing to the fact that their pedigrees were fashionable.

Mr. Bates bred his Shorthorns as did the great improvers of several leading breeds. He valued Duchess because she was the best cow he ever met with, because she gave more milk than others, and put on flesh with a smaller consumption of food. Upon these qualities he valued her and built his best tribe, and nobody supposes that, even self-willed as he was, any money would have tempted him to breed from animals which he thought bad, even of his best families. He bred to his ideal, which was confessedly based upon such practical qualities as many breeders who went for fashion overlooked.

By no other means could men in that early period attain such a towering pre-eminence. What they stood upon was that they plainly had the best cattle of their day, and that these cattle were found to reproduce their like.

Acting on this principle, even their short pedigrees were found to give quality and prepotency in an admirable degree, and yet they used a freedom in crossing when they thought fit, bringing their judgment to bear upon that important point, and thereby making judicious selections.

There is no doubt that to cross with success is a difficult proceeding. The Messrs. Booth were very successful in taking the crosses of Mussulman, Matchem, and Lord Lieutenant, but at a later date that eminent breeder, the late Mr. Richard Booth, of Warlaby, took fresh crosses by the use of Exquisite and Water King, and Mr. William Carr has told us that he was dissatisfied with the results. Indeed, Mr. R. Booth did not conceal his opinion upon the point, and did not hesitate to say that these crosses had done harm. He accordingly sold nearly all the animals which had either of those crosses.

Mr. R. Booth's views upon this question were dissented from by many distinguished breeders. It was, to say the least, doubtful, or more than doubtful, whether in the long run these crosses did the Booth cattle harm. Any bull—even of the same blood—may possibly do harm if he does not happen to suit the herd; much more may one of strange blood.

The experiment requires the greatest possible skill in selection; and, after all, it can be only an experiment—a merely tentative act—the results of which cannot, by the wisest of men, be foreseen. The results may be injurious or they may be eminently beneficial, as in the cases of Buckingham and Leonard. No one could know beforehand.

A very remarkable bull, Lamp of Lothian, bred by Mr James Douglas, of Athelstaneford, and purchased by Mr. Talbot Crosbie was out of Isabella Hopewell, whose dam was by Exquisite. The Lamp was not only a gold-medal bull, but was quite a great sire of prize-winners.

Water King was by an excellent bull, Baron Warlaby, and from a family which had always done well in Mr. Torr's hands. One of the best cows in England at one period was Lady Killerby, which was got by his son, British Boy.

In conclusion, it may be said that inter-breeding and crossing are, in their proper places, very beneficial and very necessary. In their wrong places they are both most injurious.

These may, probably, be regarded as established conclusions, and to attempt to upset either of them by quoting a few supposed exceptions is folly. —*Live Stock Journal.*

INCUBATION.

The increasing Popularity of the Incubator.

Hatching eggs by artificial means is now so common that there is no need to take up space in explaining the meaning of "incubator." A very interesting article, written for an English paper, the *Farmer and Stockbreeder*, by a writer signing himself "C.D.L.," is well worthy of reproduction. In it he states:—

"The trouble of obtaining broody hens in winter, their uncertainty as sitters, and the number of them required when any quantity of chickens is wanted, makes poultry keepers turn eagerly to incubators as an alternative to natural incubation. It is difficult to get a hen to turn broody in the cold weather, and when broody she is more easily put off sitting than in summer time. Even moving her from the house to a sitting may check the desire to sit, and finally she cannot incubate so many eggs. They need to be completely covered in winter. A hen that will cover thirteen in summer should not be trusted with more than ten or eleven. It is easy for an egg to get chilled if the hen has more than she can well cover, and as she moves the eggs each day, all in turn may get chilled, and the whole batch be spoiled.

"The possession of an incubator makes the poultry keeper independent of broody hens; it does not matter for what purpose the chicks are required, the early hatches are the most profitable. A large number of popular breeds to-day are now incubating breeds. Incubators have to be entirely depended upon when only such breeds are kept. Leghorns, Minorcas, Andalusians, Anconas, and Campines are all non-sitters, and a large number of first-cross birds kept bred from a sitting and a non-sitting variety hardly ever turn broody. Therefore, unless very little hatching is done an incubator is a necessity. The profits on early ducklings are well known, but to hatch them incubators are needed, or rather come far cheaper, and are less trouble than hens in the long run, and incubators also hatch turkey eggs satisfactorily. Goose eggs alone are not often successful in an incubator.

"It may be said that hatching is not everything. It is not. We are just at the beginning of our work when the chicks appear. They have to be reared, but artificial rearers have of late years been greatly improved, and will rear the chickens as early as a hen, and without giving the attendant any more trouble. It has often been found that artificially-reared chickens have grown faster and been hardier than those nursed by hens, and they have one great advantage—they start life absolutely clear of lice, and, if kept away from other chickens, are not likely ever to be troubled with these pests. There is also economy in feeding. It is impossible to avoid a certain waste of food when feeding quite small chickens in small lots. Chickens in foster-mothers cost less to feed proportionately, and the cost of the oil for the lamp may be set against the number of hens that would be required to nurse the chickens. A fifty-chick rearer does the work of four or five hens.

"Some poultry keepers are inclined to grumble at the initial expense of incubator and rearers (for it must be remembered the two go together, and for each incubator two rearers are required, as three-weeks-old chickens cannot be turned out of a warm foster-mother to make room for the next lot of chickens hatched), but this outlay cannot be avoided. The incubators and rearers, however, are good for several seasons if properly looked after. Poultry keeping necessitates a certain outlay for houses and appliances, and unless the poultry keeper is prepared to do this he cannot expect the fowls to bring in any profit.

"Neither can it be recommended that he buy the cheapest in the market. The main object should be to get a thoroughly reliable machine; one that consistently fails to hatch all but a small proportion of chickens from the eggs entrusted to it would be dear at a gift. Fortunately, the choice is large nowadays, but it is always safer to buy a machine from a firm that have made incubators for some time and have won a reputation for them. One may pay a little more, but it may come cheaper in the long run.

"There is nothing in the least degree elaborate about the mechanism of an incubator. To the ignorant there is something awe-inspiring about them, but the method of regulating the heat is very simple; nor is it even necessary to understand how it is done, for anyone, however little they know about them, can tend a machine when at work by merely following the simple rules given for their guidance. It may, however, be of interest to explain the principle of working for the benefit of those readers who have not yet purchased one.

"An incubator is nothing but a box to contain the eggs, heated by a lamp, and provided with an apparatus for regulating the temperature and keeping it at the desired level. The box must also contain ventilation holes, and the eggs, while in, must be subjected to a certain amount of moisture. It was a long time before inventors could hit upon any means of keeping the box or incubator at the same temperature through the day and night, variations of four or five degrees being absolutely fatal to the eggs.

"It is commonly known that all liquids have a certain fixed boiling point—one which varies considerably. For instance, water boils at 212deg. Fahr., ether at 35deg., alcohol at 173deg., sulphuric acid at 640 deg. Now the temperature needed in an incubator in a little over a hundred, about 103 or 104, and by combining ether and alcohol in a proportion of three of ether to one of alcohol we get a liquid that boils at a little below 104deg. When liquids boil they expand, and this expansion is utilised to regulate the temperature, thus: A few drops of the mixed fluid is enclosed in a capsule, and this capsule is placed so that a rod rests upon it. This rod in turn touches a lever, which has a damper on one end over the lamp. When the heat in the incubator goes a little above a hundred the capsule begins to expand, owing to the action of the fluid within; the expansion pushes up the rod, and the rod lifts the lever, and as the lever rises the damper rises also and lets off heat, thus lowering the temperature within. By means of a weight on the lever, which can be pushed up and down, the damper can be made to lie a little above the lamp at a temperature of 103½ deg., the best hatching temperature.

"An even temperature, though essential to success, is not everything, and there are various little points that have to be attended to before we can reckon on our chickens appearing out of the eggs; and, in the first place, the position of the incubator requires consideration. It must stand in a room or recess free from draughts, and the steadier the temperature the better. If the temperature of the room is always altering, more strain is put on the thermostat, the self-acting apparatus for regulating the temperature; or, in other words, the capsule containing a volatile fluid, described in the last article. Thus a shed, with a zinc roof is bad, for it gets hot in the daytime if there is any sun, and very cold on frosty nights. A shed outside the house is not suitable unless there are stout brick walls and a tiled roof and a window to it, but a spare bedroom generally serves well, or sometimes the cellar can be utilised. There must be no vibration from machinery in the vicinity, or intermittent noises liable to jar the eggs. They are, especially during the first half of the period of incubation, intensely sensitive to vibration, and will fail to hatch if jarred in the least. Oddly enough, eggs under hens will often stand a good deal of shaking without ill effects, but eggs in an incubator never do.

"The regulator or thermostat having been adjusted, the tank should be filled with hot water and the lamp lighted. Some incubators dispense with the tank, bringing the heat from the lamp, more or less directly, into the egg chamber without any hot-water pipes; these latter are called atmospheric or hot-air incubators; while the former are hot water or tank machines. Into the relative merits of these two methods there is no need to go. Excellent results have been attained by both ways. The larger number of our successful machines are hot water; though a few of the hot air are at least equally as good; but out of this country, both on the Continent and in the States, the hot-air machine is the most popular. As a rule, our colonies buy of our makers, but the latter sell few machines elsewhere. On the other hand, foreign machines have hardly any sale in this country; we are self-supporting in the matter of incubators.

"An incubator should be working for a day or two before being entrusted with eggs. This is a point where the novice often fails. The eggs are put on before the machine is running properly, and, consequently, all the eggs are spoilt. By means of the regulator and lamp a temperature of 103½deg. should be gained and fixed; the machine should run empty for at least a day and night; then, if the variation is under a degree, the eggs can safely go in. The damper should lie above the lamp at a distance of between ⅛in. and ¼in.; then, if the temperature falls, there is a surplus heat to maintain that in the egg chamber. The damper can be higher without harm, but it merely means a waste of heat.

"Though a temperature of about 103½deg. is by common consent the best hatching temperature, that of the room has also to be considered. It should be between 55deg. and 65deg. When it is colder, as may be in winter, the heat in the egg chamber should be raised a little; while in summer, if the room temperature is much above 60deg., the heat in the egg chamber should be lowered. The following rule, by a good authority, may be here quoted:—"Adjust the regulator to work at 104deg., or as under: When the room stands at 40deg., 50deg., 60deg., 70deg., or 80deg., the regulator should be adjusted to keep the machine at 106deg., 105deg., 104deg., 103deg., or 102deg. respectively.

VENTILATION.

"While in the incubator the eggs, which are embryo chicks, require a certain amount of ventilation. How much it is difficult to say. A hen will often bring off a good hatch in a very stuffy corner, and in all cases eggs under a hen only get ventilated when she is off. The ventilation holes in the egg chamber, as a rule, give all that is needed, except when the eggs are taken out to be aired and cooled. In some patterns the damper is placed over the eggs, instead of over the lamp, but I know of none successful by this method. There is so much more danger of cold air entering and all eggs getting chilled. A daily cooling is necessary, the drawer being taken out for that purpose, and the eggs at the same time should be turned to prevent the germs sticking to the yolk. Omission of these simple but necessary details will spoil the hatch; it should be done when the lamp is removed to be trimmed and refilled. When gas is available, it can be utilised with great advantage, and the trouble of daily attending to the lamp obviated.

"When we come to the matter of moisture, we touch rather a vexed point, for authorities are far from agreed how much or how little to allow the eggs. The amount they get under a hen varies very much, some hens bringing off very successful hatches when sitting in a loft, or where the eggs can get no bottom moisture, as they do when the nest is made in a hedge, or anywhere out of doors. But there must be moisture in the incubator, or else the dry air will harden the membrane of the egg, and render it impossible for the chick to escape; this is provided by a tray containing water placed under the eggs; but one can have too much of a good thing, and too much moisture will result in chickens dead in shell, dead just before they attempt to chip the shell. Forgetfulness to keep the water tray replenished, for evaporation rapidly disposes of it, is often the cause of a bad hatch.

"The drawer should not be opened and shut more than is absolutely necessary. There is always the liability to jar and chill the eggs. It is certainly an advantage to dispense with the drawer, as some machines do, substituting a lid on top. Especially when the eggs are hatching should they be left alone. The chicks will be heard chirping quite loudly hours before they emerge from the shell, and the novice opens the drawer to see how they are getting on. In some cases there is a glass in front, so that the eggs can be seen without opening the drawer—a commendable improvement.

"There should always be a spare thermometer, in case of accidents, as the incubator cannot run an hour safely without one, and the incubator room should have a thermometer in addition."

THE BRONZE TURKEY.

The Most Profitable Breed to Raise for Market.

Poultry items: The bronze turkey is in most respects superior to any other kind (so says an American exchange), a statement with which we agree. The writer goes on to say: "This breed being hardier is more likely to live when very young, and when once grown up it is beautiful and very large. The same amount of food, in fact, will produce in it as much as double the weight possible to be obtained in the ordinary turkey. For example, Mammoth Bronze male turkeys have been reared upon farms before now, which only one year old weighed forty pounds and over apiece —a weight exceeding that of the ordinary kinds, under like conditions, from twenty to twenty-five pounds. Indeed it is no great trouble to get young bronze turkeys to weigh from twenty to twenty-five pounds, and frequently as high as thirty-five pounds each, by Thanksgiving or Christmas, in which case they will command in the market a ready sale at prices also better than those paid for the smaller varieties. The most essential point, remember, is to get them started right. A turkey generally lays as many as twenty-five to thirty eggs before she thinks of incubating; therefore, the first dozen ought to be removed from her nest and set under a hen. Why? Because this leaves the turkey about what she can cover and hatch out nicely.

"Then when the little birds are hatched each of them, as a precaution against vermin and the like, should be greased with some sweet cream on the top of its head, down its throat, and under its wings. Next a large, roomy, movable coop should be prepared, in which to keep the mother and her brood until the latter has grown and gained strength, for if allowed to roam at large with them she is liable to wander so far that her little ones will be worn out and unable to return with her. And on what should they be fed? Why, the best things at first are hard-boiled eggs mixed with bread crumbs. Soon a change of diet is necessary, however, and then oatmeal and boiled rice should be given, and later on wheat. Young onions, if chopped fine, will also be greatly enjoyed, and as these are wholesome, the feeding of them, where practicable, should never be neglected. Still, it will not do to overfeed young turkeys (nor old ones, either, for that matter), since that might prove not only a drawback to their growth, but even in reducing the weight previously gained. Furthermore, the disarrangement sustained by the digestive organs, in their being overtaxed, might bring on some one of the many diseases which are so common among poultry, and which, if once firmly established, are very hard to break up and successfully eradicate. Young turkeys, therefore, should be fed regularly, and as the food in their crops digests very quickly, they should be fed quite often and not too much at a time.

"When they get old enough they should be allowed to run at will, and not be restricted, except that they should roost indoors at night and not be left out in any cold, severe storms. The time of winter markets once beginning to draw near, however, they should for several days prior to disposal be deprived of their daily expeditions, confined in narrow quarters, and there fed on purely fattening foods; in other words, given no green material whatever, but rather an abundance of corn, wheat, and similar flesh-producing eatables, care being exercised that none is left after meals to sour and spoil, for this is liable to take away the birds' appetites, and then next to nothing can be done with them. Feed, therefore, regularly and often, and to help fatten them give them more or less milk to drink. Thus dealt with the flesh produced will be more tender and juicy than could be obtained in any other way. This is a fact, for even the flesh of an old gobbler, if only fattened in this manner, will be found tender and juicy—nearly as much so as that of young birds. If you doubt, just make the experiment some time for your own satisfaction."

THE FAT HOG.

POINTS TO BE OBSERVED IN JUDGING OR BUYING SWINE.

Professor W. J. Kennedy, Iowa, writing to the *Weekly Chronicle*, U.S.A., on the above subject, says:—

"The ultimate end of the hog is the block. Thus the perfect or ideal hog is the one which most nearly meets the demands of the consumer. The butcher's preference is almost solely controlled by the demands of the market. All markets do not demand the same kind of hogs. In some the bacon hog, so named because of its long, deep side, is preferred; while in others the fat or lard hog is the most popular, especially where the demand is for hams, broad loins, and fat backs. Thus, in forming an opinion as to the best type of swine to breed, it is well to keep the requirements of these two markets in mind. They have established for us two very distinct market classes of hogs, the fat hog and the bacon hog.

"For the present we will confine our attention to the leading features of the fat hog. The fat hog of to-day is undergoing a change of form. The chubby, broad-backed hog, once so popular, is losing prestige. More length of body and depth of side are being demanded of him. The wise breeder will weigh these two points carefully before selecting new stock.

"As previously stated, the butcher's preference should be adhered to very closely. The profit in the production of hogs largely lies in successfully catering to the butcher. There are some other points, however, which must be considered in this connection. The evidence of constitution and vigour are points on which the butcher cannot realise profit. To the feeder and breeder, however, they are of the utmost importance. No man can afford to underestimate the value of constitution and vigour in the hog. They are the best specimens as yet discovered to ward off the ravages of hog cholera.

"In the judgment of any class of live stock, system is indispensable. Thus, in studying the form of the fat hog, it is of vital importance that a logical method be employed. The more important points should be given most attention, this might well come in for first consideration.

Following the order of the score card used for student work, they might be discussed as follows:—

"*Form.*—Under form we indulge the top and lower lines, the width, length, and lowness to the ground. The hogs that make the greatest gain at an early age and meet the demands of the butcher best are lowest, deep, and wide. They are compactly built, deep-chested, medium length of body, well sprung in the ribs, possess straight top and bottom lines, and stand squarely on short, straight, strong legs.

"*Quality and Condition.*—Quality is indicated by the hair, bone, and nature of flesh. The hair should be fine, straight, thick, and lie close to the body. Coarse, wiry, swirly hair is not desired, as it is usually associated with coarseness of frame and undesirable feeding qualities. The bone should be medium fine, enough bone to carry the body is all that is desired. Coarseness of bone is discriminated against by the butchers; it is an indication of a tendency to dress out a large percentage of offal. The flesh should be free from lumps or wrinkles, both of which are very undesirable. The indications of good condition are a deep, even covering of firm flesh, especially over the back, loin, hams and sides, as they are the regions where the valuable cuts are found.

"*Head.*—A short, broad head, especially wide between the eyes, and the ears is usually associated with width and compactness of body throughout, and is an indication of an aptitude to fatten readily. A snout of medium length is desirable.

"*Eyes.*—The eyes should be clear, large, wide apart, and free from wrinkles or folds of fat, which often causes blindness.

"*Ears.*—A small fine ear indicates refinement throughout; this is desirable. The carriage of the ear will depend upon the percentage of the hog, being erect in the Berkshire, half drooping in the Poland China, and almost wholly drooping in the Duroc, Jersey, and most of the large, white hogs.

"*Jowl.*—A broad, neat, smooth, firm jowl is desirable. Flabbiness of jowl, due to an excess of fat in this region, is very objectionable.

"*Neck.*—The neck should be short, thick, and deep. It should blend smoothly into the shoulder vein and shoulder without any depression.

"*Shoulder and Shoulder Vein.*—The shoulder vein is that portion just in front of the shoulder, where the neck joins the shoulder. Fulness in this part is very desirable, as it usually results in a smoothly-covered, wide shoulder. The shoulder should be broad, deep, and compact on top. Prominent shoulder blades and a slackness between the same are very objectionable.

"*Front Legs and Feet.*—The legs should be short, straight, strong, and the hog should stand well up on his toes. Many hogs are 'knock-kneed,' that is, the knees come too close together. This is very objectionable in any class of hogs, but more especially in young animals, as it gets worse with age. Too much stress cannot be laid upon the set and strength of the legs.

"*Chest.*—This is a point which the butcher pays little or no attention to, but it is of vital importance to the breeder. Width and depth of chest give stamina and constitution to the hog. The floor of the chest should be wide and close to the ground. There should be no falling away in the lower part, giving a 'tucked in' appearance in the fore flank.

"*Sides.*—The sides should be deep, long, evenly fleshed, carry width well down, and free from wrinkles. In many instances the hog with a broad back, due to a well sprung rib, is sadly deficient in depth of body and width of same in the lower parts. In other words, too many wide-backed hogs are wedge-shaped from above downward. It is not only desirable to have a broad back. It should be associated with good length of rib, giving a deep side with as much width at the bottom as there is on top. Length of side is also very desirable, even in the fat hog, on account of the increasing demand for lean meat. Any indication of wrinkles or creases in the flesh behind the shoulder or any place along the side is very objectionable. They denote uneven fattening and flesh of poor quality. The sides of a good fat hog are even, with a line from his shoulder to his ham. There should be no depression between the same. Some hogs show a depression due to an abnormal development of shoulder or ham.

"*Back.*—The back should be straight, broad, and evenly covered with flesh. Viewing the hog from the side, the back should be straight in aged animals and slightly arched in all young stock. With advanced age the back is almost sure to settle, thus the straight-backed young animal usually develops into a sway-backed aged animal. Width of back is very essential. Many hogs are so sharp in the back that they are designated as 'sun fished.' When fat they should possess an even covering of firm, thick flesh.

"*Loin.*—The loin should be wide and evenly covered with firm, thick flesh.

"*Hind Flank.*—The hind flank should be deep and in a line with the belly. A well let-down hind flank is usually associated with a well-developed ham. A full and pendant hind flank is an indication of readiness for market.

"*Hips.*—The hips should be wide apart and low and smoothly covered with flesh.

"*Rump.*—The rump should be long, smooth, and carrying width well back to the tail. There should be but very little depression or falling off from the hip joints to the tail head. Most hogs are inclined to drop off some, but straightness in this region is desirable. In the eyes of many people a drooping rump in a hog is not considered to be objectionable. This must be due to the fact that they are more accustomed to seeing hogs of that formation than those straight or nearly so. More width of rump is found where the animal approaches straightness than is usually found in the animal possessing drooping quarters. The length of a quarter to a certain extent seems to be governed by the same rule. Another very common objection, in fact one of the most serious faults to be found in the hog, is crooked hind legs and sprawly pasterns. The careful observer of animal form will soon notice that crooked hocks are nearly associated with drooping rumps. Seldom, if ever, is the crooked hock found in the animal possessing a straight rump.

Recognising these points, is it not advisable for us to pay more attention to the breeding of hogs with straight rumps?

"*Hams.*—In viewing the ham from the side it should possess much width, or be long in the quarter. From behind it should be wide, plump, and well carried down to the hocks. A great many hogs having good width of ham are very deficient in the way it is carried down to the hocks. This is an important point.

"*Hind Legs and Feet.*—The hind legs should be well set, straight, short, and thoroughly supported below the hocks. Too much stress cannot be laid on the conformation of the hind legs and feet. Here is one of the very weakest points in our fat hog. Many hogs have excellent form but poor feet and legs, thus are compelled to go begging on the market as cripples. The legs should be short, pasterns short and strong, and the hog should walk on his toes, not on his dew-claws."

ANGORA WOOL.

We have on several occasions drawn attention to the profits arising from the breeding of angora goats in this State. Great strides are being made in America towards making this one of the principal industries of that country. The following extract from an American exchange (the *Helena Record*) will be read with interest by those who have already given the question thought:—

"The outlook for the angora industry is particularly bright. Manufacturers are eager buyers of all mohair that is offered, and at no time for years has the stock of mohair on hand been so low as it was this spring. The recent use of mohair in the manufacture of felt for hats and other uses has moved all accumulated holdings of the short staple hair not used in the ordinary lines of manufacture; and hence, just previous to the arrival of this spring's clip, all Eastern stocks were reduced to a minimum. Prices this spring have been 30 per cent. higher than last, and will undoubtedly be higher next season.

"The manufacture of mohair goods is a rapidly increasing industry. New uses for the wool are being found by American manufacturers, and a far greater consumption in the future can safely be predicted. Two of the largest manufacturers of mohair goods in the country are adding extensively to their present plants. One concern in Maine is hurriedly building a new factory, where 1,000 additional looms will be installed for the manufacture of mohair and alpaca linings. This corporation is the largest manufacturer of mohair plushes in the country; consumes thousands of pounds of raw material daily, and in some departments its looms are run both day and night.

"A keen interest in the angora goat is evident throughout the Eastern and Middle States, where a considerable number have been shipped, and are a source of unusual profit to their owners. Besides their value as a fleece-bearing animal, they are of great worth in the clearing of brush lands, and in many localities so demonstrated their ability in this respect as to materially advance the value of brush lands capable of being transformed into cultivable tracts or fields. The demand for animals is eager, and a ready sale is to be had for the best class of does and high-bred bucks.

"Montana breeders will have a great advantage in this trade in animals, for the Northern-grown stock is much preferred by New England and Eastern farmers.

"Mohair grown in this latitude has a greater length of fibre or staple, due to the fact that the clip is shorn but once a year; whereas in the warmer climate of the Southern States the angora must be shorn twice or the fleece will be shed off and lost. The long staple mohair is much desired by manufacturers; and besides being of most worth in itself for spinning into yarn, it must be had to blend or use with the short fibre mohair in order that this shorter product may have any value to the manufacturer.

"Although I have visited all the principal angora-raising sections in the country, I have seen no locality more promising for the success of the angora industry than Montana. I believe the growing of mohair and the raising of breeding animals for Eastern shipment will prove an important industry in this State.

"A most favourable impression is held in the East of Montana live stock, and it is to be hoped Montana breeders of the angora goat will not make the mistake of buying and making their start with inferior, low-grade animals. To do so is bound to bring disappointment, for the quality of fleece will not be such as to make the animals profitable, nor will the offspring command a compensative price either in the home or Eastern markets. It will pay far better to own a few good goats than to own a large number of inferior animals, and struggle with the task of breeding them up to the higher standard of angoras. The lessons to be learned in the receiving and sorting rooms of the manufacturers are most convincing of the value of good stock as compared with low-grade animals.

"I visited one place in the backwoods of California where a half-breed woman and her three daughters take care of a herd of 2,000 goats, without the aid of any man. The girls herd them and raise a fine quality of mohair.

"There is such a demand for good registered angora goats, and the breeders are so satisfied with them, that the majority are not willing to part with any of their herds. In Southern Texas, where the first rain this year fell on 11th March, the goat-raisers are the only people who make a living, for the grass has been literally killed by the drought."

BENEFICIAL PARASITES.

VALUE AS COMPARED WITH CHEMICAL INSECTICIDES.

Dr. W. B. Wall at Santa Ana Farmers' Institute: As there is no place on the programme for this paper, it will be brief, the object being to call attention to the question of freeing our fruit trees from the scales now costing such large sums of money to keep in check by fumigating or spraying, either process doing more or less harm to fruit and foliage. No other method has as yet been found, except by parasites, and to these it is desired to direct special attention, and to discuss the best manner of using them, *i.e.*, so as to derive the greatest benefit from their work.

If we had parasites that would exterminate the red and black scale in the incredibly short time that the ladybird (the *vedalia cardinallis*) did the white cottony-cushioned scale, they could be entrusted with the entire work, however badly the tree might be infested. This, however, is not true of any parasites now attacking these scales, although such as we have would no doubt practically exterminate them after a time. Meanwhile several crops of fruit might be ruined and the tree badly damaged. Therefore, in my opinion, the best method of procedure will be to fumigate only the badly-infested trees (fumigation necessarily kills friend and foe alike), put the parasites on those having few scales, nurse the infant industry until strong enough to need no further protection, after which time the parasite will complete the work without charge.

There are many beneficial parasites—no attempt will be made to enumerate them. As yet we have none for the purple scale, as far as I know.

Of the ladybirds alone there are said to be more than 1,000 specimens known throughout the world, and these are the most valuable of any predaceous or parasitic insects. The *rhizobius ventralis* has done good work on the black scale. This was procured and sent out by our excellent and efficient horticultural quarantine officer, Alex. Craw, from whom I have recently received a colony of a South African parasite (*scutellista cyanea*), a minute black fly, which he thinks will prove a great enemy of the black scale. There are other parasites for this scale. The recently-imported Chinese ladybird is a voracious feeder upon the San José scale, each larva consuming by count 1,500 scales a day. Further, they multiply rapidly. It is to be hoped that they will also feed upon the red and purple scale.

On 20th August of the present year I found red scale parasited by a very minute yellowish fly. Its larva is very much like that of the male red scale in appearance, but not as large. Two days later I sent a few of these little flies and a parasited orange to Alex. Craw for identification. He replied, referring me to the report of the State Board of Horticulture for 1891, and further said that it was the same fly (*coccophagus citrimus*) that he found in the spring of 1889 parasiting the San Gabriel yellow scale.

In a letter to the *California Fruitgrower*, September 21, 1889, Professor D. W. Coquilett says of this fly: "Acting Entomologist Howard writes me that it is probably a new species belonging to the genus *coccophagus*." He further says: "It is a minute four-winged fly, scarcely as large as the head of a small pin. Its eggs are laid singly in or upon the scale, and after completing its growth and passing through its preparatory stages it gnaws a round hole through the scale, and thus makes its escape."

The little mite of a fly parasiting the red scale in this neighbourhood has four wings, but makes its escape from under the raised scale and not through it, so it may be a different species, but of the same genus as the yellow scale parasite. At any rate, it is doing excellent work on the red scale.

I examined an orchard in Tustin a few days ago, in which a colony of *rhizobii* were liberated three years ago, and found only a few black scale, and these on very few trees, and but few red ones, and some of these parasited.

These trees, at one time as black as the scales could make them, are now clean and bright. This orchard has been fumigated annually. To the North, across the road, in an orchard which has not been fumigated for two years, not a black scale was found, and only very few red ones on perhaps not over 3 per cent. of the trees, and some, or most of these parasited. About a dozen large orange trees and two lemon trees on an adjoining lot were examined. On the orange trees a free sprinkling of red and black scales, on the lemon many of each. Large per cent. of these parasited. These trees were fumigated about a year ago.

While in possession of the enemies of the black scale only, parasites were of but little concern to us, for we were compelled to fumigate for the red anyway. Now, having parasites for both, I am fully convinced that, with judicious management, fumigation can in a year or two be dispensed with, leaving the parasite to do the work.

Allow me to urge special attention to this very important matter.

Note.—The *Rhizobius ventralis* referred to is a native of Australia and is fairly common in the South-West of Western Australia, where it does good work in keeping in check the black and some of the scales allied to it. It is, however, parasited with us, whereas in California it is free from its Australian enemies. The *Scuttellista Cyanea* is a small fly parasite. A colony was a few months ago entrusted to Mr. T. Hooper, inspector under our Insect Pests Act for this (African) department, on the occasion of Mr. Hooper calling at Cape Town, by Mr. Lounsbury, entomologist of the Cape Colony. These parasites have since been bred in captivity, and strong colonies are now at work, which it is intended to distribute shortly amongst fruitgrowers plagued with black scale.

AGRICULTURAL EDUCATION.

A Crying Necessity for the Modern Farmer.

An old farmer said to me recently: "What makes you such a crank about your cows and milk? What is the use of straining milk through wire and four thicknesses of cheese cloth? What do you want your milk so cold for, anyway? You waste water enough in that aerator, as you called it, to water two cows. If this was a dry year, I guess you wouldn't cool your milk quite so much. I kept and milked cows for over 50 years before you were born, and I never went to all that bother; it don't pay. I don't think much of your paper farmers, anyway."

I replied: "Uncle, I use cheese cloth enough to catch every particle of dust that passes through the wire, and I keep the water cold because the colder milk is the longer it will keep, and milk that will keep makes satisfied customers, and when my contract expires I will have no trouble in renewing it. I know you have kept cows for years, and my experience has been very short; still, I know that you are getting now less than 200 pounds daily from 13 cows, while with nine I am getting 280. What little I know I learned by studying dairy literature."

The average farmer certainly needs education. If you question the opinion of a lawyer, he refers you to the decision of the courts. Ask the gardener why he adopts a particular mode of pruning a vine, and he will refer you to his work on horticulture. Ask the mechanic why he cuts here or there, and he refers you to his style of plan of architecture. The tailor fashions his cloth from patterns or measurements, and thus obtains a correct fit. Every piece of machinery and the plates of our steel ships are moulded from patterns, and the workmen, having something to go by, turn out a perfect piece of work. But many of our farmers follow their calling in almost total darkness.

Ask him why there is more nourishment in a bean than in a carrot; why a certain combination of grain will produce a greater flow of milk than one kind alone; ask him what elements of the soil a certain crop requires for the best results, and he will tell you that his time is so occupied with his business that he has no time for reading nonsense.

In his pitiful ignorance and narrow-mindedness he will tell you that he farms as his father farmed before him, and these high-priced gentlemen and college farmers can teach him nothing. He knows by experience that a fresh cow will give more milk than a dry cow, and a cow on the flush of feed will do better than one on short pasture. He puts his crops in in the full of the moon, and trusts to an all-wise and merciful Providence for results. He knows manure will give him a good crop, but he canno explain why.

Book farming certainly pays. Put into his home a good, all-round agricultural paper, and his children will learn more in a few weeks than their father has acquired in a life-time of observation. A man cannot successfully carry on a dairy, in these times, without knowing something of the principles of his business. It is an indisputable fact that the successful dairyman of to-day is not only a close student of literature pertaining to his calling, but he studies the markets and commerce in general. We are under obligations to the leading dairy papers of the day. They have stepped forward most nobly and generously to elevate the farmer's and dairyman's calling, which is too often performed in the old mill horse-plodding round of duty, too often taking steps in the dark.

I, for one, tender them my sincere thanks and unfeigned gratitude for their endeavours to place us in the scale of upward progression and intellectual improvement. I would like to see the dairymen of the country awaken to a sense of the unthinking methods in which they pursue their labour. It is time for the dairymen to awaken from their slumbers and assume their proper position, and stand up and advocate their own cause; study and explain their views and practical observations in their business, and the best method of profitable production and improvement.

The business of agriculture is one of the most honourable and most ancient of which we have any record. It is recorded by Moses, the first historian and lawgiver, that our first parents were farmers; therefore, no one should be ashamed to be a farmer. It is said that the business of dairying is confining and laborious. The same is true of any business or profession which is conducted on sound business principles. No business can be successful without deep thought, constant study, and close application to every detail.

The business of tilling the soil is an indispensable one, and one of the most general occupations of the human race, and merits as sound principles as any other pursuit. It is closely and most intimately connected with the mechanical and manufacturing interests and commerce. They cannot exist without support from each other. Agriculture is the basis on which the superstructure of all others must rest. The mechanic is necessary to our business; we need his tools with which to till our soil and plant and harvest our crops; it is by his skill and perseverance we have those highly improved implements now so abundant everywhere. The farmer and dairyman are indispensable to the mechanic, for without them how would he procure his meat, butter, milk, flour, and vegetables? If the mechanic can place his goods upon the market at a profit over expense of raw material and manufacture, why cannot the dairyman, by sound business methods, do the same? He certainly can, if he will.—*Exchange.*

THE COW NO MACHINE.

Is a Being who quickly Responds to Kind Treatment.

The cow is looked upon by altogether too many dairymen as a mere unfeeling machine, the dairyman having but to apply the belt and power of food when the machinery is immediately set in motion that will result in a return to the dairyman for his outlay in a sure and given amount of milk; that under any and every condition, whenever our dairyman at his own convenience places before her the proper food, the amiable and long-suffering cow will at once be compelled, by reason of her internal organism, to commence the manufacture of milk which the dairyman may, without let or hindrance on her part, take from her at the close of the process.

It is humiliating to know that in the dairy business, best of all our agricultural pursuits, where self-interest alone might be expected to prompt each one to seek for knowledge on points of care, feeding, etc., and with all the wealth of teaching on the subject of proper dairying, there is yet a large percentage of dairymen who act upon the foregoing theory that the cow is but a machine; that she must, whether she will or no, manufacture and give down her milk just as the mill makes flour from wheat.

On the contrary, the cow has an extremely sensitive organism, which demands the same thoughtful care in providing for her comfort that we give our human kind; food of the right kind, at the right time and in the exact amount she can best take care of; light, fresh air, freedom, temperature carefully regulated; comfort of body and peace of mind.

This statement may sound to many extreme, but it is supported by abundant testimony, and failure to recognise its truth on the part of so many dairymen (not all, by any means) is costing the owners of nearly 20,000,000 cows in the United States many millions of dollars each year. It is certainly a subject worthy the serious attention and study of every thoughtful, progressive dairyman, and one which will repay in dollars and cents the time thus expended.

A cow is no more a machine than is the human mother. She is, if properly treated, a gentle, sensitive creature, governed by the same laws of love and fear that obtain among human mothers. Note with what affection and pleasure she gives down her milk to her calf, and will continue so to do for a kind master; but in anger or fright, in cold, in filth, tormented in a thousand ways known and unknown, or on insufficient food, is it reasonable to expect the same generous, healthful product?

A machine might do equally good work but even a machine has its limitations—in a freezing temperature and under other adverse conditions; but the cow, if she is compelled to remain out of doors or in a cold barn at her master's will, unconsciously avenges herself, as much of her food must go for fuel purposes to keep her bodily warmth up to the required temperature. A well-made machine will undoubtedly do equally good work if there are a half dozen dogs and as many milking stools asserting themselves in its vicinity; but not so with the gentle cow, made irate by either or both. Not only is the quality of her milk damaged (often to the point of rendering it poison to the young infant), but the quantity of it is as certainly and promptly reduced.

The cow is not a machine. She repays all manner of care for her creature comfort with an increased flow of milk; and, even more than this, she responds in the same generous way to words of endearment and petting. It is common knowledge that many a herdsman and milker has, by his gentle and genuine love for his cows, so completely won their affection that no one else has ever been known to get the same amount of milk that he can. If this sounds absurd to any, let them try the experiment of making their herd perfectly comfortable in every way, allow no one to handle them that would be other than kind and gentle; banish flies, banish extremes of heat and cold, filth on floor or body, unpleasant odours about the stable, and all unnecessary restraint and confinement, and note the result. Whoever makes a faithful trial of these things will be abundantly repaid, not only in increased flow of milk and in dollars and cents, but in that inner satisfaction and delight which come to every man who is kind, indulgent, and charitable to the speechless animals under his care.—*Hoard's Dairyman.*

NARROGIN EXPERIMENTAL FARM.

The first half-yearly report of work done at the Experimental Farm at Narrogin has been received by the Hon. the Minister, of which the following is a summary:—

"In July about 30 acres were under cultivation, and 10 more were added to it, making in all about 40 acres. One acre was devoted to the experimental plots, which had previously been sown by Mr. Berthoud. Off the 40 acres 30 tons of splendid hay have been harvested, which I think very fair, taking into consideration the late sowing and the sourness of the ground, as it was simply cleared, ploughed, and sown straight away. Owing to want of accommodation, etc., it was deemed advisable to make hay of the experimental plots, with the exception of three varieties of wheat, viz., crossbred No. 67, Fillbag, and Allora Springs, the seed of which I have saved, they having done remarkably well. There are now ready another 50 acres, which are being fallowed. Next year I hope to have 150 acres under crop.

"Ten miles of four wires and 2ft. 6in. wire netting fencing have been erected, also two miles of Cyclone subdivision fencing. A great deal of time and labour was spent clearing the line for the fencing, owing to the heavy timber. The homestead block, consisting of 225 acres, has been grubbed of all poison, but it will be some time before it is properly eradicated, as it keeps shooting up. A contractor has blocks 59, 60, and 61 to grub of all poison. The scarcity of water on the farm has been a great drawback. A well has been sunk to a depth of 69ft., but at the present time there is only about 7ft. of water in it. A windmill has been erected over the well, and piping laid a distance of 500ft. up to two 1,000-gallon tanks, which are intended to supply the residence, stabling, etc. There is a soak half a mile from the buildings, but it is drying up fast, though I hope when the ringbarked timber all dies it will be more permanent. The residence is almost completed. A galvanised iron shed, 40ft. x 60ft., has also been built. Stone has also been carted by the farm hands for the stabling, which are about to be erected.

"The poultry yards I have taken down, and replaced them with neat and substantial ones. I regret to state that I have been very unsuccessful with the incubator, the cause of which I attribute to having the machine in a galvanised iron room, there being no other place available; consequently it was impossible to keep the required temperature. I have only hatched eight Buff Orpingtons and three Silver Grey Dorking chicks.

"The stock on the farm consists of two draught geldings, one draught mare, one very old light horse sent up from Subiaco, two Ayrshire cows, one yearling heifer, and one yearling bull. The farm has been visited by a great number of people, including several intending settlers and most of the farmers in the district.

IN SEARCH OF PARASITES.

Three letters have been received from Mr. Compere, the entomologist attached to the Department of Agriculture, who is at present touring various countries in search of the parasites for the several insect pests which infest this country. The letters are dated from Hong Kong, and concerning them Mr. A. Despeissis reports as follows:—"Three packages containing parasites of the black scale (*Lecanium oleæ*), red scale (*Aspidiotus auranti*), and two kinds of aphis-eating ladybirds were received. The packages were one month in transit. The aphis-eating ladybirds arrived dead. The red scale parasites, of which very few specimens were sent, did not come out at all, and I doubt whether we will breed any out of the specimens sent. The black scale parasites have met with better luck. Of these there are two distinct varieties, viz., one which seems identical with or very closely related with the scutellista wasp lately introduced from the Cape and another much smaller wasp. Numerous dead parasites of these two sorts were found in the packages when opened. Since arrival they have been placed in glass jars in the care of Inspector T. Hooper, who reports that to date ten parasites have issued from the black scales, and they are still coming out. These have been liberated on a black scale-infested bush, and are under the protection of a muslin cover. The colonies bred out of this one it is proposed to liberate on more scale-infested bushes until sufficient insects are available for stocking orchards and garden plants with. Mr. Compere also mailed specimens of the fruit-fly which we have to contend with in Western Australia, and makes further interesting remarks about three species of fruit-flies which occur at Hong Kong and vicinity."

PRODUCERS' CONFERENCE.

The following circular has been sent out by the Chief Clerk to all societies, convening the next Producers' Conference, to take place on 24th March :—"I have the honour to inform you that the Tenth Annual Conference of Producers will commence on Tuesday, 24th March, and I shall be glad if you will forward to me, on or before the 28th February, without fail, any resolutions your society may wish brought forward.

"This year only one delegate is to be sent from each society, and I shall be obliged if you will let me know the name of your representative, and the station from which he will travel, not later than the above date, in order that the usual free pass may be sent in good time.

"The Conference this year, I may say, is to be a purely business function, and, consequently, unless the agenda paper is much enlarged, it will probably take less time than heretofore.

"In conclusion, I would urge the necessity of immediate action being taken in this matter, as it is imperative the particulars asked for should be furnished on the dates named, and no names of delegates or resolutions will be received after the 28th February."

GARDEN NOTES FOR FEBRUARY.

By PERCY G. WICKEN.

This month is probably the worst in the calendar for vegetable growing, and, with the exception of pumpkins, marrows, French beans, and tomatoes, vegetables are in poor supply. This short supply is, however, not so noticeable, as a liberal supply of fruit is to hand. The principal work to be carried out during the month is to keep the surface soil constantly stirred by means of the hoe or rake, or in a larger area by the horse cultivator, and thereby conserve all the moisture possible in the soil. Select those plants you intend to preserve for seed purposes and put a mark on them. Be sure and select those true to name and the healthiest plants you can find, and allow the seed to thoroughly mature before harvesting. All weeds should be cut down before they have an opportunity to seed. By this means they are gradually got rid of. Other work in the garden will be principally preparing the land for future crops. As soon as a crop has ceased to be productive it should be pulled up, the ground dug, manured, and prepared for the following crop. Even if the succeeding crop is not to be sown immediately, the ground should be prepared in this manner, and the surface should be stirred again before sowing the seed. Orchards are likely to be troubled with the fruit-fly maggot during this and the following months. Any fruit affected should be at once pulled and destroyed, either by burning or boiling, so as to prevent the insect reaching the adult stage and laying eggs for a fresh brood. This is one of our most serious pests, and every effort should be made to cope with an outbreak immediately it is noticed. Settlers in doubt as to how to treat any insect pests should at once communicate with this Department, when instructions as to how to proceed will be at once forwarded.

The noxious weed, Stinkwort, will again be spreading and becoming troublesome, and should be cut down as soon as possible, and on no account allowed to seed. If a sharp look out is kept for this weed and it is destroyed as soon as found, much labour and expense will be saved for the future.

Where water is available for irrigation, considerable advantage will be derived from its use. During this dry weather vegetables and other crops can be kept growing by a liberal supply of water. The water should be applied in large quantities, so as to soak deeply into the soil. A light watering encourages surface roots, and the plants soon wilt when hot weather comes on them. After each irrigation the ground should be thoroughly stirred to conserve the moisture applied.

BEANS (French).—A few rows of these may be sown to keep up a supply wherever there is sufficient moisture in the soil to germinate the seed or where water is available for irrigating.

Bean (Madagascar) should now be in bearing. They are very hardy, and, if picked young and eaten the same as French beans, form a welcome addition to the table.

Beans (Lima).—A further supply of this plant should be sown. They are a delicious vegetable, and should be grown in every garden. The bean is shelled and eaten the same as peas, and they can be either used green or dried and used as haricot beans.

Beet (red).—A small quantity of this seed may be sown. The ground should be well manured some time previously. They should be sown in drills and the drill well soaked before sowing the seed. The drill must be kept moist afterwards.

Brussels Sprouts.—This vegetable should do well in the cooler parts of the State, and is well worthy of attention from growers. A small quantity of seed may be planted in a seed bed for transplanting out later on.

Cabbage and Cauliflower.—Seed beds may be made so as to obtain a supply of plants for planting out later on in the season.

Carrots.—A few rows may be sown on land that has been well manured for the previous crop.

Melons—Rock, Water, and Preserving.—These should be now carrying a full crop. Those required for seed should be selected early in the season and marked so that they are not eaten. These should be allowed to become thoroughly ripe before cutting. Melons should always be cut early in the morning, as they will keep and carry better than if cut in the afternoon.

Maize.—The earlier varieties will now be ripening, but should not be pulled until fully ripe. Those required for table use should be pulled as soon as the grain is formed, and cooked immediately.

Sorghum will require to be hilled up, and the cultivator kept going between the rows. It should not be cut for feed until the seed head is well formed.

Pumpkins should be cut, and, if not forwarded to market, should be put into a shed as soon as ripe and kept for future use. They are valuable both for table and for stock feed.

Sweet Potatoes.—Keep the land well stirred between the rows until the runners take possession of the ground.

Tomatoes.—Liberal quantities of this vegetable are now forthcoming. Any showing signs of black rot or other fungus disease should be picked off the vine and destroyed, so as to prevent the spread of the disease.

Turnips.—Where sufficient moisture is available, a supply of this vegetable may be planted out for an early crop. They should be sown in drills about 3ft. apart, and the plants thinned out as soon as they appear a few inches high.

Farm.—Harvesting operations now being over, the principal work will be fallowing the ground for the next crop. Wherever the land is soft enough to allow the plough to work, the land should be turned over as soon as possible after harvest. In ploughing land, care should be taken that it is not ploughed the same depth for two years in succession, as this causes a hard pan to form, which the roots of the plants are unable to penetrate. The depth should be varied each year, one year a little deeper and the other year a little shallower. A field should also not be ploughed in the same direction for two years running, but should be cross-ploughed on every alternative ploughing A very bad habit of cutting the string bands into chaff with the hay has become a practise of late years. This should be at once discontinued, as it causes the death of a number of horses, who are unable to pass the twine through their bodies, where it forms into balls, and thereby causes death. It is very little trouble to cut the bands off, and the twine comes in useful for a number of purposes on the farm and garden.

THE CLIMATE OF WESTERN AUSTRALIA DURING DECEMBER, 1902.

"Good day; most remarkable weather!" is the usual greeting just now. It usually is here at the close of the year, but it happens to be founded upon a correct appreciation for once. Last December was the coolest ever recorded in Perth since observations commenced in 1875. The average of the daily maximum readings was only 79·2° at the Botanical Gardens, and 75·4° at the Observatory, as against means of 83·4° and 80·2° respectively for previous years. December is seldom oppressively hot, but there are very few years in which the temperature does not reach 100° at least once, and 90° several times. On this occasion, however, it only reached 90° once in the Gardens, and not at all at the Observatory, the highest readings for the month being only 92·0° and 89·2° respectively. It was not only in Perth that the temperature was below the average for previous years, but almost throughout the State. It was, however, specially noticeable on the West coast.

The effect of the sea breeze in modifying climate is as usual very marked. Thus the mean maximum and minimum temperatures along a line running approximately East and West are—

	Mean max.	Mean min.
	°	°
Rottnest	70·9	59·3
Fremantle	73·7	59·6
Perth Observatory ...	75·4	57·6
Perth Gardens	79·2	58·4
Guildford	...	...
Northam	85·6	55·9
Southern Cross	91·0	58·0
Kalgoorlie	89·3	61·1

The temperature has been delightfully cool at the favourite seaside resorts. Thus the mean maximum at—

		°				°
Geraldton	was	77·0	...	Busselton	was	75·2
Rottnest	„	70·9	...	Cape Leeuwin	„	70·0
Fremantle	„	73·7	...	Albany	„	70·5
Mandurah	„	76·6	...	Breaksea	„	68·0
Bunbury	„	72·9	...	Esperance	„	75·5

At Bridgetown, as might be expected, it was warmer in the day than on the coast, but this town has the record for the coolest nights, the mean minimum temperature being only 47·6°.

Turning to the other side of the picture we find that almost unbearable heat was experienced in the North-West and Kimberley divisions, the worst place being Marble Bar, where the mean daily maximum was 107·0° and the highest individual reading 117·0°.

The atmospheric pressure throughout was normal, the means being in remarkably close agreement with the average for previous years at nearly every station.

The rainfall was very light and below the average for previous years at all stations except in the extreme North and extreme South-East.

The Climate of Western Australia during December, 1902.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					December, 1902.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:															
Wyndham ...	29·800	29·785	29·991	29·644	98·1	81·7	89·9	105·2	72·8	101·4	80·8	113·0	68·0	415	3384
Derby	29·820	29·824	29·967	29·688	99·0	76·9	88·0	110·8	72·8	98·0	79·1	111·0	70·0	3	1549
Broome ...	...	29·830	...	...	...	...	...	...	...	94·3	79·6	108·9	69·0	...	...
Condon ...	29·810	29·794	29·956	29·725	92·2	70·6	81·4	104·8	63·4	96·1	74·9	115·0	60·0	Nil	2074
Cossack ...	29·810	29·810	29·977	29·672	94·6	72·3	83·4	112·0	66·0	98·0	77·2	115·0	64·0	Nil	1306
Onslow ...	29·880	29·844	29·960	29·690	92·0	69·0	80·5	113·0	62·0	98·2	68·8	121·0	53·0	Nil	441
Carnarvon ...	29·883	29·868	30·029	29·711	84·2	67·4	75·8	102·3	61·5	86·2	67·3	117·0	52·0	1	910
Hamelin Pool...	29·874	29·889	30·084	29·848	93·8	63·5	78·6	109·4	57·2	95·2	64·4	111·8	53·2	Nil	691
Geraldton ...	29·945	29·945	30·060	29·720	77·0	59·0	68·0	92·0	50·0	81·8	61·9	110·0	49·0	15	1434
INLAND:															
Hall's Creek ...	29·822	29·816	29·960	29·724	100·9	76·2	88·6	108·5	71·7	101·3	75·6	110·2	60·0	177	1719
Marble Bar ...	...	...	...	...	107·0	74·0	90·5	117·0	66·0	...	...	...	...	15	1240
Nullagine ...	29·770	29·777	29·936	29·572	103·0	69·3	86·2	112·0	60·2	105·8	74·6	113·0	63·0	25	1674
Peak Hill ...	29·770	29·786	30·000	29·560	97·0	70·0	83·5	108·0	57·0	100·5	74·6	109·7	63·0	55	1953
Wiluna ...	29·768	...	30·006	29·625	96·3	68·2	82·2	109·0	54·0	...	...	...	...	95	1452
Cue	29·880	29·830	30·020	29·590	96·5	66·0	81·2	108·0	52·0	99·1	69·5	112·0	50·5	6	900
Yalgoo ...	29·840	29·856	30·010	29·600	96·0	62·0	79·0	109·0	50·0	97·1	64·9	113·5	52·2	Nil	610
Lawlers ...	29·817	29·827	30·040	29·602	93·7	66·5	80·1	108·4	54·0	97·7	71·0	110·4	59·0	55	1224
Laverton ...	29·841	...	30·050	29·547	92·8	65·4	79·1	109·3	50·4	...	...	...	...	48	1328
Menzies ...	29·840	29·856	30·110	29·780	91·0	64·0	77·5	107·0	52·0	94·7	66·3	110·9	50·2	7	1126
Kalgoorlie ...	29·868	29·896	30·112	29·576	89·3	61·1	75·2	108·0	52·5	92·2	62·7	110·0	49·0	14	1201
Coolgardie ...	29·884	29·891	30·143	29·615	89·5	59·1	74·3	108·6	47·8	92·3	61·4	110·2	49·0	17	1470
Southern Cross	29·860	29·884	30·090	29·610	91·0	58·0	74·5	110·0	48·0	93·4	60·4	113·0	47·4	17	1021
Walebing ...	...	...	...	...	84·6	54·2	69·4	101·4	45·0	...	...	...	...	13	1145
Northam ...	...	...	...	...	85·6	55·9	70·8	100·5	47·0	...	...	...	...	38	973
York	29·930	29·928	30·150	29·730	84·0	55·0	69·5	97·0	46·0	88·1	60·8	114·5	42·0	44	1022
Guildford ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during December, 1902—*continued.*

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					December, 1902.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST :															
Perth Gardens	29·982	29 963	30·162	29·721	79·2	58·4	68·8	92·0	49·6	83·4	60·4	114·0	47·0	26	2652
Perth Observatory	29·992	29·975	30·159	29·717	75·4	57·6	66·5	89·2	49·7	80·2	60·2	102·8	49·2	22	2706
Fremantle ...	30·006	29·954	30·192	29·750	73·7	59·6	66·6	84·8	52·5	79·0	61·7	106·0	48·0	20	2456
Rottnest ...	29·986	29·950	30·158	29·724	70·9	59·3	65·1	80·0	53·0	77·5	60·1	102·5	46·0	16	2212
Mandurah ...	...	...	...	...	76·6	55·5	66·0	90·3	44·3	...	...	...	...	20	2586
Wandering ...	...	...	...	...	80·8	49·6	65·0	95·0	38·0	...	..	...	...	20	1789
Collie	...	...	...	...	77·1	49·0	63·0	92·2	39·9	...	...	...	...	49	2781
Donnybrook ...	...	...	...	...	76·4	49·9	63·2	91·9	41·9	...	...	...	...	63	2890
Bunbury ...	29·990	29·980	30·190	29·720	72 9	53·0	63·0	83·0	44·0	78·1	56·9	105·0	44·0	28	2507
Busselton ...	...	...	...	...	75·2	50·2	62·7	85·0	42·0	...	...	...	...	40	2466
Bridgetown ...	...	...	...	...	76·1	47·6	61·8	91·0	38·0	...	...	...	...	109	3062
Karridale ...	30·035	30·008	30·220	29·700	71·0	53·0	62·0	85·0	45·0	73·7	54·6	101·0	43·0	109	4527
Cape Leeuwin	29·985	29 978	30·260	29·580	70 0	59·0	64·5	77·0	54·0	71·5	60·1	98·4	53·0	74	4382
Katanning ...	29·910	29·960	30·220	29·650	80·0	53·0	66·5	96·0	45·0	83·9	52·9	105·8	41·0	14	1429
Albany ...	29·990	30·002	30·260	29·620	70·5	53·7	62·1	87·0	46·2	70·7	57·1	103·0	41·2	59	4061
Breaksea ...	29·980	29 989	30·320	29·590	68·0	57·0	62·5	80·0	50·0	68·5	57·4	94·0	46·0	52	4016
Esperance ...	29·955	29·988	30·210	29·570	75·5	55·1	65·3	103·8	42·0	77·3	58·0	108·0	40·8	42	2448
Balladonia ...	29·922	...	30·233	29·459	82·1	53·4	67·8	102·0	41·9	...	...	...	...	183	1690
Eyre	29·916	29·972	30·286	29 498	75·3	56·0	65·6	97·0	44·5	79·4	57·2	112·2	38·2	139	1723

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory, Perth,
7th January, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for November, 1902 (completed as far as possible), and for December, 1902 (principally from Telegraphic Reports).

STATIONS.	NOVEMBER. No. of points. 100 = 1in.	NOVEMBER. No. of wet days.	DECEMBER. No. of points. 100 = 1in.	DECEMBER. No. of wet days.
EAST KIMBERLEY:				
Wyndham	400	8	415	7
6-Mile	435	3	...	...
The Stud Station	471	8	...	...
Carlton	399	5	...	..
Rosewood Downs	...	...	...	...
Argyle Downs	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek	216	9	150	7
Plympton,St. Mary	...	...	...	...
Koojubrin	...	...	...	...
Hall's Creek	140	8	177	8
Flora Valley	...	...	...	...
Ruby Plains	...	...	...	...
Denison Downs	69	...	...	...
WEST KIMBERLEY:				
Obagama	297	5	...	...
Beagle Bay	210	2	...	...
Derby	69	2	3	1
Yeeda	234	5	...	...
Liveringa	192	4	...	...
Mt. Anderson	...	...	...	...
Leopold Downs	...	...	...	...
Fitzroy Crossing	73	4	42	3
Fitzroy (C. Blythe)	...	...	...	...
Quanbun	171	2	...	...
Nookanbah	...	...	...	...
Broome	9	1	...	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay	58	1	14	2
NORTH-WEST:				
Wallal	74	2	Nil	...
Condon	Nil	...	Nil	...
De Grey River	23	2	...	...
Port Hedland	Nil	...	Nil	...
Boodarie	Nil	...	...	...
Yule River	...	...	...	...
Warralong	15	1	...	...
Muccan	75	1	...	...
Ettrick	26	1	...	...
Mulgie	...	...	...	...
Eel Creek	...	...	...	...
Pilbarra	Nil	...	Nil	...
NORTH-WEST—*cont.*				
Coongon	...	...	...	...
Warrawagine	82	3	...	...
Bamboo Creek	114	2	Nil	...
Marble Bar	23	2	15	1
Warrawoona	29	2	15	...
Corunna Downs	153	3	...	...
Nullagine	313	4	25	2
Yandicoogina	...	...	...	...
Kerdiadary	85	1	...	...
Roy Hill	97	2	...	...
Mosquito Creek	...	...	...	...
Mulga Downs	62	1	...	...
Woodstock	...	...	...	...
Mt. Florence	13	2	...	...
Tambrey	64	2	...	...
Millstream	...	...	...	...
Yandyarra	Nil	..	...	...
Mallina	Nil	...	...	...
Whim Creek	Nil	...	...	...
Cooyapooya	...	...	...	...
Woodbrooke	...	...	...	...
Croydon	Nil	...	...	...
Balla Balla	9	1	Nil	...
Roebourne	Nil	...	Nil	...
Cossack	9	2	Nil	...
Fortescue	Nil	..	Nil	...
Mardie	Nil	...	...	...
Mt. Stewart	...	...	...	...
Yarraloola	Nil	...	...	...
Chinginarra	...	...	...	...
Onslow	Nil	...	Nil	...
Peedamullah	Nil	...	...	...
Red Hill	Nil	...	...	...
Mt. Mortimer	...	...	...	...
Wogoola	...	...	...	...
Nanutarra	...	...	...	...
Yanrey	...	...	...	...
Point Cloates	...	...	...	...
GASCOYNE:				
Winning Pool	16	2	Nil	...
Towara	...	...	...	...
Ullawarra	...	...	...	...
Maroonah	Nil	...	...	...
Gifford Creek	Nil	...	...	...
Bangemall	Nil	...	...	...

RAINFALL—*continued.*

STATIONS.	NOVEMBER.		DECEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	45	1	...	...
Yanyeareddy ...	80	3	...	...
Williambury ...	1	1	...	...
Wandagee ...	...	...	...	...
Bernier Island ...	Nil	...	...	...
Boolathana ...	...	...	...	...
Carnarvon ...	9	1	1	1
Cooralya... ...	...	...	...	...
Doorawarrah ...	...	...	...	...
Mungarra ...	83	3	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	...	...	...	...
Errivilla... ...	...	...	117	1
Dirk Hartog Island	Nil	...	...	...
Sharks Bay ...	Nil	...	...	...
Kararang ...	...	...	...	...
Meedo	24	2	...	...
Tamala	...	...	...	...
Wooramel ...	3	1	Nil	...
Hamelin Pool ...	Nil	...	Nil	...
Byro	20	1	...	...
Yarra Yarra ...	12	1	...	...
Berringarra ...	21	1	...	...
Mt. Gould ...	...	...	...	...
Moorarie... ...	...	...	...	...
Wandary... ...	Nil	...	...	...
Peak Hill ...	26	2	55	2
Horseshoe ...	7	2	3	1
Mt. Fraser ...	8	2	..	...
Abbotts	Nil	...	...	...
Meekatharra ...	Nil	...	...	...
Belele	...	...	...	...
Mileura	32	1	...	...
Milly Milly ...	...	...	2	1
Manfred ...	2	1	...	...
New Forest ...	Nil	...	...	...
Woogorong ...	...	...	...	...
Boolardy... ...	...	...	...	...
Billabalong ...	Nil	...	...	...
Wooleane ...	Nil	...	20	1
Murgoo	Nil	...	Nil	...
Meeka	Nil	...	..	...
Mt. Wittenoom ...	Nil	...	7	1
Nannine	13	2	20	1
Star of the East...	14	2	...	...
Annean	Nil	...	15	1
Tuckanarra ...	20	1	7	1

STATIONS.	NOVEMBER.		DECEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Coodardy ...	...	...	...	...
Cue	Nil	...	6	2
Day Dawn ...	Nil	...	4	1
Lake Austin ...	Nil	...	6	1
Lennonville ...	Nil	...	...	...
Mt. Magnet ...	Nil	...	3	1
Wurracoothara...	3	2	4	1
Challa	Nil	...	Nil	...
Youeragabbie ...	Nil	...	...	...
Murrum	Nil	...	...	...
Burnerbinmah ...	Nil	...	...	...
Yalgoo	Nil	...	Nil	...
Gabyon	Nil	...	...	...
Wurarga ...	...	...	...	...
Gullewa	Nil	...	...	...
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	2	1	...	...
Mt. View ...	Nil	...	...	...
Mumby	5	2	12	3
Yuin	...	...	...	...
Northampton ...	Nil	...	10	2
Mt. Erin ...	Nil	...	Nil	...
Oakabella ...	...	...	...	...
Narra Tarra ...	...	...	...	...
Tibradden ...	...	...	...	...
Sand Springs ...	Nil	...	Nil	...
Mullewa... ...	Nil	...	...	...
Kockatea ...	Nil	...	27	2
Bootenal ...	Nil	...	...	...
Geraldton ...	3	3	15	1
Greenough ...	Nil	...	Nil	...
Dongara ...	Nil	...	8	1
Dongara (Pearse)	Nil	...	12	1
Strawberry ...	Nil	...	...	...
Mingenew ...	4	3	17	3
Mungah ...	...	...	14	2
Rothesay ...	Nil	...	...	...
Field's Find ...	...	...	...	...
Carnamah ...	Nil	...	27	1
Watheroo ...	Nil	...	5	1
Dandaragan ...	Nil	...	10	1
Moora	3	1	3	1
Yatheroo ...	...	...	...	...
Walebing ...	3	1	13	1
New Norcia ...	4	1	42	3

RAINFALL—*continued.*

STATIONS.	NOVEMBER.		DECEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	7	1	35	1
Belvoir	Nil	...	60	1
Mundaring ...	34	3	67	3
Guildford ...	10	2	...	...
Kalbyamba ...	17	4	51	3
Canning W't'r'w'ks	18	3	42	2
Perth Gardens ...	9	3	26	2
Perth Observatory	11	3	22	1
Subiaco	5	3	18	1
Claremont ...	5	2	42	2
Fremantle ...	5	2	20	2
Rottnest	2	2	16	2
Armadale ...	27	5	...	...
Rockingham ...	14	2	40	1
Canning River ...	...	...	...	...
Jarrahdale ...	10	1	71	2
Mandurah ...	17	2	20	1
Pinjarra	23	5	42	2
Yarloop	41	5	54	5
Harvey	50	5	53	4
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley ...	Nil	..	...	...
Momberkine ...	4	1	...	...
Mouglin ...	5	2	...	...
Newcastle ...	2	1	15	1
Eumalga ...	2	1	22	3
Northam ...	Nil	...	38	1
Grass Valley ...	Nil	...	...	...
Meckering ...	Nil	...	48	2
Cunderdin ...	...	...	...	...
Codgen	Nil	...	...	...
Jarragin... ...	Nil	...	...	...
Doongin... ...	Nil	...	28	2
Cuttening ...	Nil	...	60	2
Whitehaven ...	...	...	Nil	...
Sunset Hills ...	6	2	21	1
Cobham	3	2	...	...
York	3	1	44	2
Beverley ...	Nil	...	6	1
Stock Hill ...	5	2	39	2
Sunning Hill ...	6	2	10	1
Wandering ...	8	1	20	2
SOUTH-WEST—*contd.*				
Pingelly ...	Nil	...	...	...
Marradong ...	13	1	45	1
Bannister ...	13	3	40	4
Narrogin ...	23	3	31	3
Wickepin ...	7	1	...	...
Gillimaning ...	11	2	16	1
Bunking ...	4	2	...	...
Bullock Hills ...	24	2	...	...
SOUTH-WEST DIVISION (SOUTHERN PART):				
Bunbury ...	48	4	28	4
Collie	40	5	49	5
Salvation Army Settlement	39	5	...	...
Glen Mervyn ...	58	4	169	9
Dardanup ...	69	5	84	4
Donnybrook ...	45	4	63	4
Boyanup ...	...	...	57	5
Ferndale ...	31	2	...	...
Busselton ...	43	9	40	8
Lower Blackwood	100	6	...	...
Karridale ...	39	9	109	8
Cape Leeuwin ...	59	13	74	...
Biddellia ...	61	8	...	...
The Warren ...	94	5	113	7
Lake Muir ...	40	5	54	6
Mordalup ...	51	10	36	9
Deeside	39	6	55	8
Riverside ...	78	9	32	2
Balbarup ...	71	8	67	7
Wilgarup ...	67	6	78	5
Mandalup ...	74	5	...	...
Bridgetown ...	45	8	109	6
Greenbushes ...	36	5	134	3
Greenfields ...	49	5	...	...
Glenorchy ...	52	3	...	...
Williams ...	11	3	35	2
Arthur	46	6	...	...
Darkan	34	...	...	...
Wagin	17	1	12	3
Glencoe ...	27	2	22	3
Dyliabing ...	19	2	...	...
Katanning ...	34	5	14	...
Kojonup ...	35	3	34	...
Broomehill ...	28	...	12	4
Sunnyside ...	44	5	18	4
Woodyarrup ...	29	2	13	4

RAINFALL—*continued.*

Stations.	November.		December.		Stations.	November.		December.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.		No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West—*contd.*					Eastern—*contd.*				
Cranbrook	15	2	...	...	Burbanks P.O.	114	2	21	4
Blackwattle	29	3	...	...	Burbanks Birthday Gift	111	3	16	2
Mt. Barker	49	5	...	...					
Kendenup	23	2	24	3	Woolubar	67	3	Nil	...
St. Werburgh's	53	7	...	...	Widgiemooltha	100	3	27	3
Forest Hill	41	8	...	...	50-Mile Tank	92	2	8	1
Denmark	40	2	...	...	Waterdale	89	3	...	...
Grasmere	63	8	76	8	Norseman	63	2	67	4
Albany	140	10	59	11	Bulla Bulling	109	3	47	4
Point King	108	6	57	3	Woolgangie	114	3	...	...
Breaksea	84	11	52	14	Boorabbin	50	3	16	1
Cape Riche	26	3	...	...	Karalee	27	2	...	...
Pallinup	42	4	...	...	Yellowdine	38	3	35	2
Bremer Bay	71	4	47	4	Southern Cross	45	4	17	1
Jarramongup	49	5	...	...	Mt. Jackson	29	2	...	...
					Bodallin	119	3	...	...
Eastern Division:					Burracoppin	...	...	25	1
Lake Way	16	1	95	...	Kellerberrin	Nil	...	23	1
Mt. Sir Samuel	23	1	25	2	Mangowine	Nil	...	...	...
Lawlers	5	3	55	4	Wattoning	...	...	...	...
Leinster G.M.	13	2	...	...					
Lake Darlôt	...	...	...	...	Eucla Division:				
Mt. Leonora	11	1	10	3	Ravensthorpe	104	4	43	5
Mt. Malcolm	9	1	5	1	Coconarup	72	5	71	8
Mt. Morgans	42	1	19	3	Hopetoun	104	7	25	4
Burtville	145	5	...	...	Fanny's Cove	137	4	...	...
Laverton	42	2	48	3	Park Farm	121	7	...	...
Murrin Murrin	28	2	13	2	Esperance	122	9	42	4
The Granites	33	2	48	2	Gibson's Soak	172	6	...	...
Tampa	35	2	...	...	30-Mile Condenser	155	6	...	...
Kookynie	26	2	13	1	Swan Lagoon	129	10	...	...
Niagara	37	...	Nil	...	Grass Patch	150	8	...	...
Yerilla	13	1	...	...	Myrup	149	5	74	6
Edjudina	67	3	52	4	Lynburn	229	7	82	5
Menzies	22	3	7	3	Boyatup	163	8	...	...
Mulline	72	3	45	1	Point Malcolm	195	8	130	3
Waverley	77	2	6	...	Israelite Bay	172	8	135	4
Goongarrie	38	2	20	1	Bulbinia	...	...	...	...
Mulwarrie	88	4	4	1	Frazer Range	122	4	...	...
Kurawa	370	2	4	1	Balladonia	172	5	183	5
Kurnalpi	108	4	7	2	Southern Hills	129	4	...	...
Bulong	97	3	16	3	Eyre	199	7	139	9
Kanowna	105	3	19	1	Madura	...	...	...	...
Kalgoorlie	104	3	14	2	Mundrabillia	...	...	...	...
Coolgardie	97	3	17	3	Eucla	102	7	312	7

The Observatory, Perth,
7th January, 1903.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during December, 1902.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of														
					Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomoloes.	Pines.	All other fruits.
Fremantle ...	7112	6525	587	587	136	10	1519	1781	893	872	...	869	...	20	399	...	...	...	26
Albany	457	440	17	17	56	75	28	179	21	...	4	...	...	...	69	7	...	...	1
Geraldton ...	12	12	...	...	...	...	3	...	...	...	...	...	...	...	...	...	9	...	...
Esperance ...	13	13	...	...	...	1	..	3	4	...	...	...	...	...	4	1	...	...	...
Total ...	7594	6990	604	604	192	86	1550	1963	918	872	4	869	...	20	472	8	9	...	27

Department of Agriculture,
8th January, 1903.

Return of Fruit Trees and Plants imported into Western Australia during December, 1902.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.															
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	1	100	1	100	...	.	...	100	...	...	...	...	.	...	...	...	..	...	...	...	...	...	...
Albany ...	1	47	1	47	...	...	...	47	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	..	...	...	...	...	...	...	..	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	2	147	1	147	...	...	...	147	...	...	.	...	...	...	...	...	...	...	...	...	...	...	...

Department of Agriculture,
8th January, 1903.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

NOTES.

CODLIN MOTH.—This much-dreaded pest has at last been found in this State. An article dealing with the best way of treating this insect appears in this issue.

SALE OF FERTILISERS.—The regulations dealing with the sale of fertilisers are published in this issue for general information. It is hoped that all those buying will insist on being furnished with a certificate of analysis.

ILLAWARRA ORCHARD.—A very interesting article, describing a visit to the Illawarra Orchard, is contributed by the Chief Inspector, Mr G. Buchanan, and should be read by all who are anxious to run an orchard on proper and profitable lines.

AGRICULTURAL LECTURES.—In this issue will be found a continuation of the lectures given by Mr. Despeissis at the Technical College, Claremont. The lectures contain a fund of valuable information, and copies of the *Journals* containing the first ten lectures may be obtained by writing to the Department.

NOTICE TO CONTRIBUTORS.—The Editor will be pleased to receive contributions for the *Journal* on agronomic subjects generally. These should be brief and to the point, and written on one side of the paper only. Reports on the state of crops, and stock and produce movements in the various localities, will be much appreciated.

WHAT ONIONS WILL DO.—To keep off disease, eat onions raw. To cure spasms, rub them on the spine. To cure typhoid fever, bruise with a hammer and bind on the feet. To cure chills, bind around waist and to the pulse. Bind to throat for diphtheria. For a burn, wet with raw juice. To cure a cold, boil and eat with butter. For croupy babes, slice and sprinkle with butter and cover closely; when the juice runs out give spoonful every hour. To keep people at a distance, just eat a few raw ones in the early spring. They are a great stimulant, in the raw state, both of energy in yourself and in others.

PREVENTION OF ROTTING IN TIMBER.—Woodwork exposed to the weather frequently rots from the effect of water entering the joints. It has been suggested that this rotting may be largely prevented by the simple expedient of putting a little powdered sulphate of copper (bluestone) into mortises and joints when fixing the structure in position. Rotting of wood is largely due to the presence of fungi, and sulphate of copper is a powerful fungicide. Used in the manner suggested, any water entering a joint will diffuse the sulphate of copper through the wood and prevent its decay. So simple a remedy is worth trying.

STEEL AND WOODEN WHEELS.—Of the many machines devised for the saving of labour and money for the farmer, none are so important as those for the transport of his produce—whether about the farm or on the roads. In this hot climate a deal of trouble is experienced with the old wooden wheels, tyres and spokes continually becoming loose. Boxes want wedging up, and if any of the three is neglected, the whole wheel is ruined. It takes money to keep a wooden wheel in good order, and time and money is lost while the wagon is laid up waiting for the wheel repairs. The American farmer, to obviate this difficulty, has been quick to see the great advantage of an all "steel wheel" over the wooden one, with the result that they now use no other. "Steel wheels and broad tyres" is their motto. They run lighter and last longer.

WHITE ORANGES.—It is said that in a few years white oranges may grace the American dinner table or the fruit stand. One of the explorers of the Agricultural Department of the United States of America discovered this freak of nature in his rambles along the shores of the Mediterranean, and took some of the cuttings from the tree to the United States. These were carefully grafted on an ordinary stock at the department grounds, and are now three feet high. A cutting of this plant was sent to Southern California to be tried in that climate. A couple of years will see the first fruit. If it proves of fine flavour, it will become popular and be widely distributed. But while such claims are made, there is no probability that the new fruit will prove of any value except as a curiosity. [There is another kind of orange that is but little known, a native of India. This orange, when perfectly ripe, retains its green colour. It does not appear to be so popular as the orthodox golden yellow orange. This is accounted for by reason of its uninviting colour.—Ed. *Journal*].

WHY WE SHOULD EAT APPLES.—German chemists have established the fact that apples contain a large per cent. of phosphorus, the element essential to the renewal of the nervous matter of the brain and spinal cord, while the acids are of signal use to persons whose livers are sluggish owing to sedentary habits, the acids serving to eliminate from the system noxious deposits which would retard the action of the brain and induce skin ailments and produce boils. Hence the wisdom as well as relish of taking apple sauce with roast pork and goose. The malic acid of ripe apples, either raw or cooked, will neutralise any excess of chalky matter engendered by eating too much meat, says the St. Louis *Republic*. It is also a fact that such fresh fruits as the apple, the pear, and the plum, when taken ripe and without sugar, diminish acidity in the stomach rather than provoke it. Their vegetable salts and juices are converted into alkaline carbonates, which tend to counteract acidity. A good, ripe, raw apple is one of the easiest of vegetable substances for the stomach to deal with, the whole process of its digestion being completed in 85 minutes.

EXPERIMENTAL PLOT AT GINGIN.—A number of crops were sown on a small plot of land kindly placed at the disposal of the Department for this purpose by Mr. A. H. Edgar, of Strathalbyn. The seeds were sown during August of last year, but after sowing, which was rather late, were treated to a spell of very dry weather, which caused most of the young grasses to die off as soon as germinated. These should have been sown in the autumn, but the land was not available at that time, and therefore a later sowing was made. A number of the grasses did very well, and gave a supply of green feed until well into the summer months. Among the English grasses, the Perennial Rye has done best. Of imported grasses, the Paspalum Dilatatum and Paspalum Virgatum have given splendid results. They have made a splendid growth, and at the end of the summer are quite green and still growing well. The African Wonder Grass has also given a very satisfactory yield, and is very green and succulent. Of fodder plants, the Cow Pea has made the best growth, and still looks well. This crop is well worth further attention. A further sowing will be made in the autumn.

MERIT OF ORANGE JUICE.—Professor Kiosto, an eminent Japanese bacteriologist, also Professor Koch and others, have shown that the acid of lemons, apples, and other fruits, citric acid and malic acid, are capable of destroying all kinds of disease germs. Cholera germs are killed in fifteen minutes by lemon juice or apple juice, and typhoid fever germs are killed in half an hour by these acids, even when considerably diluted. If you squeeze a lemon into a glass of water containing cholera germs, and let it stand fifteen or twenty minutes, you may drink the water with impunity, as the germs will be dead. These juices will kill other disease germs. Instead of telling a man to have his stomach washed out, we can now tell him to drink orange juice, which will cleanse the stomach as thoroughly as a stomach tube, providing it is not a case of gastric catarrh. If we have to deal with gastric catarrh, in which there is a large amount of tenacious mucus adhering to the walls of the stomach, a stomach tube to dislodge it is required, but in ordinary cases of biliousness, foul tongue, bad breath, sick headache, and nervous headache, a fruit diet is a wonderful purifier. The fruit diet will cleanse the stomach and the alimentary canal, and drive off disease germs, which are responsible for a large share of our ailments.

AGRICULTURAL LECTURES.

By A. Despeissis.

ELEVENTH LECTURE.

Potassium is the constituent of a fertile soil or of fertilisers which ranks third in costliness. It does not occur as such, but as combinations, such as chloride (muriate), sulphate, carbonate, nitrate, silicate, etc.

Potash is also known as potassium oxide (K_2O), and as such is reckoned when valuing fertilisers.

In manures it occurs as sulphate and as muriate (chloride of potassium), the sulphate form being a little more costly than the muriate.

The chief sources of potash are—

Wood Ashes, which constituted for a long time the chief source of supply of potash used for agricultural purposes. The incombustible part of "ash" of farm crops and timber contains from one-fourth to one-third its weight of potash. For this reason newly cleaned land, well timbered, on which the wood has been burnt off the ground, will have an ample supply of potash to supply the requirements of the crops for some seasons, at all events.

Kainit is, on account of its low price in Europe, in great favour as a cheap form of potassic fertiliser. Owing to its great bulk, however, the price in Australia is about double what it is in England. It is chiefly extracted from salt mines in Germany, and was originally deposited from sea water, and is associated with salt, gypsum, and other saline substances. The crude kainit found in commerce contains 12 to 13 per cent. of potash (equivalent to about 24 per cent. sulphate of potash), 27 to 30 per cent. of magnesia salts of little or no use as a manure, and 30 per cent. of common salt, which in the Eastern districts of this State, particularly when the land is in places more or less permeated with saline matters, could certainly be dispensed with. It is more valuable in light loam than in heavier soils, which it makes more sticky. A fair dressing per acre would be from 3 to 6cwt., mixed with other fertilisers, and worked into the soil by means of the plough or the digging harrows.

Sulphate of Potash, which is the chief potash salt in kainit, is also sold in a more concentrated form than in that crude salt, and, if found in commerce, with a percentage of 50 to 54 per cent. of potash, or more than four times the amount per cent. found in kainit. Although its price is considerably higher than that of kainit, at the same time, growers far inland will find it more advantageous wherever freight and cartage is a consideration, the fertiliser being four times more concentrated ; 1cwt. per acre forms a good dressing, in conjunction with other manures.

Chloride, or Muriate of Potash, a combination of potash and hydrochloric acid, which formerly was called muriatic acid, is the most soluble of the various salts of potash, and when purified contains as much as 63 per cent. of potash or 80 per cent. muriate of potash. It is obtained as a by-product in the manufacture of chlorate of potash, in the purification of nitre and other manufactures. Its use, however, is harmful on certain crops, as in the case of sugar beets, in which it lessens the percentage of crystallizable sugar, while potatoes are rendered waxy, and the tobacco leaves are deteriorated in value ; in the soil it is, besides, apt to give rise to the formation of common salt, while the sulphate gives rise to the formation of gypsum, which, in saline soils, is especially of value.

In soils potash occurs in quantities ranging from ·01 to 2 per cent., equivalent to 350lbs. to 70,000lbs. per acre taken to a depth of 1ft. ; it is derived from the weathering of minerals containing it as an ingredient, and chiefly from felspars, one of the constituents of granite. It may be said that a soil showing ·03 per cent. of potash on analysis does not usually need a potash fertiliser. Crops not fed on the ground remove amounts of potash which vary greatly. Beets may remove as much as 100lbs. per acre, and cereals about 30lbs. The percentage of potash in soils usually rises with their contents of clay. Reclaimed swamps and sandy soils are almost invariably benefited by the application of potash fertilisers.

Green Manuring affords one of the best and cheapest methods of adding *humus* or organic mould to poor sandy soils more especially. The term is applied to some quick-growing crop which is ploughed in green, decays completely in the soil, thereby enriching it and improving its physical condition. Two classes of plants are used : first, those which are not exacting in their demand for plant food and constitute a cover in the winter which checks loss by washing or drainage, and second, those which gather plant food from the air as well as from the subsoil, and leave it on the surface for the use of succeeding crops. To the first class belong rye, buckwheat, rape, dandelion, Cape barley, mustard; to the second, the legumes—clovers, peas, vetches, lupins. By the process of green manuring, loose soils are made more retentive, and clay soils lighter. Cow peas, although very desirable as green manure, are not used in orchards where winter-growing plants only are exclusively grown. For that purpose the most desirable plants are crimson clover (*Trifolium incarnatum*), an annual which germinates and develops quickly. Eight to ten pounds of seeds will sow an acre. The growth of the crop will be greatly stimulated by the application of some phosphate and potash fertilisers. When grown, it will act in three distinct ways : first, as a winter covering to the soil; second, as a summer mulch, and thirdly, as a plant food gatherer. Experiments at the Jersey Experiment Station, U.S., found that a growth of 13 inches produced 168lbs. of nitrogen, worth £5.

The Canadian Field pea has also given very satisfactory results. Sow about 85 to 100lbs. per acre, or plough the crop in the early spring, using a chain on the plough to cover and drag in all vines under the earth.

It is said that two crops of mustard or rape, grown in close succession and ploughed in, have, besides enriching the ground and modifying its physical condition, the further advantage of getting rid of couch.

Green manuring may, under particular circumstances, be overdone and become detrimental. In dry localities it may lead to the desiccation of the soil. It is calculated that one part of vegetable matter requires 300 to 500 times its own weight of moisture, so that every ton of green manuring crop in a dry locality would absorb 300 to 500 tons of water, which is equivalent to 3 to 5 inches of rainfall; and unless plentiful rain or abundance of artificial water can be relied upon, the process may in some cases be detrimental.

Moreover though green manuring the soil may be made so loose and open that the winds cause it to dry out quickly, and the power of drawing moisture, by capillary force, from the stores of free water underneath may be destroyed or at least greatly lessened.

The results of commercial fertilisers are much more marked when applied on land well stocked with *humus* than when used on land depleted of vegetable mould.

THE RESPECTIVE AND COMMERCIAL VALUE OF FERTILISERS.

Chemical fertilisers are bought on their analysis. Under the Fertilisers and Feeding Stuffs Act of Western Australia it is imperative for the manure vendors to furnish, with the invoice for any fertiliser sold, a certificate showing the per cent. of nitrogen, phosphoric acid (soluble and insoluble), and potash contained in the manure. Mention of any other ingredient is of little or no value, and may be considered as so much padding, which is liable to confuse the purchaser. Failure to comply with this enactment may be meted out by a £20 fine. The more concentrated the fertiliser is, as regards any one or more of the three elements mentioned, the more valuable it is; so much less dead weight having to be handled and carried to the field.

Perhaps there is no material or produce bought by the farmer or sold from the farm the value of which can so little be judged by appearance as manures.

The only safe means of distinguishing a rich sample of a given manure from a poor sample is by analysis, *i.e.*, by a statement of determinations made in the chemical laboratory, according to scientific methods, of the proportions of each of the constituents of the substance analysed in 100 parts by weight of that substance or the percentage.

But, whilst the chemist often makes a complete analysis of a manure to satisfy himself of its genuineness, the farmer buying it is interested only in two, three, or four of the figures which the chemist gives. In fact, since the value of the manure depends chiefly on the phosphate of lime, potash, and nitrogen in it, and the forms of combinations in which these occur, these figures in the report are the only ones the buyer need understand.

It is necessary to know something about the "forms of combinations," as bulk or degree of solubility will vary according to these, and will influence freight, quickness of action, and particular requirements of the individual soil or of the crops.

Unit Value.—For the purpose of the valuation of artificial manures, the worth of each substance is expressed in "so much a unit," that unit value being the value of one per cent. of the particular ingredient in a ton of the substance.

To find the value of a unit, we divide the price of one ton by the percentage composition of the manure.

Conversely: To check the correct value of a manure, we multiply the market worth of each unit or fraction of unit by the percentage of that particular substance.

The unit value of fertilisers varies from time to time in the same locality, and is also somewhat different in various localities. It fluctuates with the cost of freight and carriage, and also with the available supply.

As we have seen above, 14 parts of nitrogen equals 17 parts of ammonia. If therefore a commercial fertiliser is offered containing four per cent. nitrogen, this is the same as saying that it contains $4\frac{17}{14}$ of ammonia which equals 4·85, and sounds or reads better.

Sometimes, though not often, the figure is made to look more attractive by being stated as equal to "Sulphate of Ammonia," which bears to nitrogen the proportion of 14 to 65, and in the above example the dealer would be equally right in stating that his manure contains of nitrogenous substance an amount equivalent to 19·14 per cent. of sulphate of ammonia.

It is thus seen that expressing the nitrogenous contents of a manure in terms of, say, sulphate of ammonia or of nitrate of soda (of which 85 parts equals 14 parts of nitrogen), the unsuspecting farmer, who would not purchase a manure on a statement of one per cent. of nitrogen or 1·2 per cent. ammonia might be gulled into buying it if the nitrogen was entered as "equal to 4·7 per cent. of sulphate of ammonia," and yet the three figures all represent the same fact, for that reason under the Fertilisers and Feeding Stuffs Act, the invoice, to guard against impositions of that sort, must state the minimum guarantee of *nitrogen* as such.

Phosphoric acid and phosphate of lime are likewise often a source of confusion as stated on a chemical analysis. This confusion disappears when it is remembered that the relationship between phosphoric acid and phosphate of lime is quite as simple as that between nitrogen and ammonia; 142lbs. or parts of phosphoric acid always form 310lbs. or parts of phosphate of lime, so that to convert the former into the latter one may multiply by 2·2 (approximately correct). If, therefore, the analysis of a manure is returned as 15 per cent. of phosphoric acid it is equivalent to saying that it contains 33 per cent. of phosphates.

Conversely a bonedust containing 50 per cent. of phosphate of lime contains somewhat less than half this amount of phosphoric acid, or 22·6, or in exact figures 22·58 per cent.

As regards Potash, we have seen above that it usually exists in manure in two forms: sulphate of potash and muriate or chloride of potash.

And just as a buyer may be led into purchasing a manure through its nitrogen being expressed as nitrate of soda or as sulphate of ammonia, so may the contents of a manure be made to look more attractive by being stated as sulphate of potash.

It takes of pure potash 94lbs. or parts to form 174lbs., or parts of sulphate of potash, whereas the same amount of potash will form 149lbs. or parts of muriate or chloride.

To convert potash, therefore, into terms of sulphate of potash multiply by 1·85, and to convert it into terms of muriate by 1·58.

Kainit, therefore, stated in an analysis equals 12·5 per cent., is equivalent to 12·5 by 1·85, equals 23 per cent. sulphate of potash.

To sum up what we have just explained, it is useful to remember the co-efficients used for approximately converting the various terms mentioned into their equivalents:—

To convert nitrogen into terms of ammonia ...	multiply by	1·2
„ „ sulphate of ammonia ...	„	4·7
„ phosphoric acid into phosphate of lime	„	2·2
„ potash into sulphate of potash ...	„	1·85
„ „ muriate of potash ...	„	1·58

The unit value of nitrogen varies greatly, even in the several Australian States, this difference in value being mostly influenced by sea and railway freight, and also by the degree of solubility and the richness of the several substances:—

	Western Australia.	Melbourne and Sydney.
Nitrogen in sulphate of ammonia ...	16s. to 18s. per unit	12s.
„ nitrate of soda	...	Do.
„ blood or offal ... ... (ground fine).	14s. to 15s. per unit	10s.

If we express by 10 the worth of nitrogen in nitrate of soda, nitrate of potash, sulphate of ammonia, and live guano:—

7 will be its worth in blood, bones and meat,
2–3 in hair, leather waste, wool.

That is to say, if an application of nitrogen in the form of nitrate of soda, etc., produces a surplus crop of 1,000lbs. of fruit or produce, an equivalent amount of nitrogen derived from blood, bone, and meal would only produce an increase of 700lbs., and a similar dressing of nitrogen from wool-waste, etc. would only produce an increase of 200-300lbs.

So with phosphoric acid equal bone phosphate, more valuable than mineral phosphate, and so with potash. Each grade has a unit value of its own.

Market value of phosphoric acid also varies greatly according as to whether it is soluble or insoluble in water:—

	W.A.	Eastern States.
Water soluble phosphoric acid (a unit)	...	6s.
Insoluble ,, ,,	3s.	2s. 6d.
Citrate, soluble ,, ,,	5s.	4s. 6d.
Potash in soluble salts	7s.	6s.
Potash in natural manures, such as dried nightsoil, etc.	5s.	4s.

These prices, of course, fluctuate a little according to the state of the market, the quantity bought, and as to whether the transaction is a cash one or one involving terms.

To arrive at the value of a fertiliser, and unless it is specified whether the nitrogen, the phosphoric acid, and the potash are derived from the better prized material, these ingredients are considered as being derived from baser ones when calculating values.

TWELFTH LECTURE.

Knowing these values, it is easy, when furnished with an invoice certificate, to determine the real value of the manure offered. Thus a mixed fertiliser contains—

Nitrogen (or sulphate of ammonia)	4 per cent.
Phosphoric acid—water sol.	5 ,, ,,
,, ,, citrate sol.	2 ,, ,,
,, ,, insoluble	3 ,, ,,
Total phosphoric acid	10 ,, ,,
Potash muriate	4 ,, ,,

This statement is treated as follows:—

	£	s.	d.
4 per cent. nitrogen and sulphate of ammonia, at 16s.	3	4	0
5 ,, phosphoric acid, soluble, at 7s.	1	15	0
2 ,, ,, ,, citrate sol., at 5s.	0	10	0
3 ,, ,, ,, insol., at 3s.	0	9	0
4 ,, potash, at 7s.	1	8	0
	£7	6	0

Or, again, bonedust contains 4·5 per cent. nitrogen and 20 per cent. phosphoric acid :—

	£	s.	d.
4·5 per cent. at 14s.	3	3	0
20 ,, at 3s.	3	0	0
	£6	3	0

In this manner the purchaser can arrive at a fair value of the manure offered to him, to which, of course, must be added the cost of carriage from the manure works.

FERTILISERS WHICH SHOULD NOT BE MIXED.—As fertilisers are themselves chemical compounds, it is important that when mixing them or applying them to the land for the benefit of a crop, they should not be mixed in a form which would result in wasteful or undesirable reactions.

The following mixtures should not be made :—

F.Y.M. or dung lime and basic slag.
Nitrate with phosphatic slag.
Nitrate with superphosphate.
Sulphate of ammonia with phosphatic slag.
Superphosphate with slag.

The following are safe :—

Sulphate of ammonia with superphosphate.
Nitrate with bones.
Sulphate with bones.
Bones with slag.
Nitrate with phosphatic guano.
Sulphate with phosphatic guano.

At times some of the chemicals have a tendency to "set," *i.e.*, nitrate of soda and kainit, and thus have to be powdered again to enable them to be sown. Rub as soon as mixed, apply to land. Keep as dry as possible until then. Land will absorb and prevent loss.

EFFECT OF FERTILISERS ON CROPS.—Chemical analysis discloses the component constituents of crops. When a plant is burnt, the ashes represent the sum total of the minerals it has extracted from the soil; the ashes also show in what proportion these minerals are present. Thus, knowing the average yield of any ordinary crops, we are also able to tell how much of each mineral extracted from the soil the ground has been robbed of.

Those ashes or mineral constituents of plants are invariably made up of eight or sometimes nine essential minerals:—Iron, calcium, magnesia, potash, phosphorus, sulphur, also soda, silica, chlorine, and sometimes manganine.

Nitrogen, which is not found in the residue of burnt plants, is likewise mainly drawn from the soil, and will be considered as one of the essential ash constituents.

Now, of these essential minerals there is an unlimited store in the soil. Three only are scarce, they are nitrogen, phosphoric acid, and potash; and all ordinary manures and mixtures of manures are simply the commercial forms and substances containing these three chemical bodies, and all *manurial experiments* resolve themselves into ascertaining which of these substances, either alone or in combination with others, yields the best results.

Moreover, potash, one of these three substances, is in a great many cases so abundant in soils, especially soils of a clayey nature, that the problem to solve in such cases is—how much *phosphates* and how much *nitrates*, and in what form and at what price, will yield the best paying crops.

DOMINANT INGREDIENTS.—It often happens that two different crops make very different demands upon the same mineral ingredient of the soil. First, one may take away more than the other; secondly, it may have a shorter period of growth in which to store it up; thirdly, it may be less abundantly supplied with roots for searching for it in the soil; fourthly, it may send its roots deeper down, or in a shallower layer of soil than the other; or, fifthly, it may absorb it more readily in a different form or combination.

It does not always follow, therefore, that the material removed in the largest quantity is the one requiring to be replaced also in the largest quantity. Field experiments and practical experience have shown that it is not so, but that some other material is the "dominant ingredient" which is required by the crops to yield full returns.

As a result of these observations, crops have been grouped into several classes:—

1. Benefited by nitrogenous manures.
2. Not benefited by nitrogenous manures.
3. Benefited by phosphatic manures.
4. ,, ,, potash.
5. ,, ,, special dressing.

Such a classification enables the cultivator to make provision for the peculiarities of the different crops.

Group I.	*Dominant Ingredient.*
Cereals:—Wheat Barley Oats Rye *Leafy Crops*:—Cabbages Rape Rhubarb Celery Beetroot Mustard	Nitrogen.
Group II.	
Leguminous Plants:—Clover Lucerne Vetches Beans Peas Sainfoin	Mixed minerals, but not particularly nitrogen.

Group III.	*Dominant Ingredient.*
Turnips and Swedes Parsnips Maize Artichokes and most crops	Phosphoric acid.
Group IV.	
Potatoes Peas, Beans, Tares Lucerne, Sainfoin Tobacco Mangolds and root-crops	Potash.
Group V.	
Salt-loving plants Mangolds Beet Asparagus	Common salt and sulphate of magnesia (kainit).

OVER MANURING.—Crops will respond to the application of manures almost anywhere. Their growth will also be stimulated to a greater or lesser extent in harmony with the degree of tilth of the soil, the clemency of the weather, and the suitability of the climate.

There is a limit, though, even under the most favourable circumstances, beyond which fertilisers, however much is used in conjunction with the growing of the crop, will fail to add to the yield.

By means of plot experiments, as will be explained further on, this point of the usefulness of a crop may be definitely ascertained.

POTATO EXPERIMENT:—

	tons	cwts.	
With no manure the yield was	4	5	per acre.
„ 8cwts. complete manure ...	9	0¼	„ „
„ 16 „ „ „	9	3½	„ „
„ 24 „ „ „	9	8½	„ „

Showing no advantage from any dressing in excess of the 8cwts.

Very often over-manuring not only means a waste of money, but gives rise to practical injury to the crops.

Wheat and other cereals become too long in the straw, which causes them to be "laid" or battered down by wind and rain. Root crops become spongy and gorged with sap, and their sap vessels burst, or they are swollen with watery fluids less nutritious than in the case of more moderate crops.

Potato crops run too much to leaf, and do not form their tubers until too late.

On pastures the stronger and coarser grasses will be encouraged, to the injury of the finer and more nutritious kinds.

EFFECT OF FERTILISERS ON CROPS.—Speaking in a broad sense, nitrogen applied as a fertiliser produces flag, leaves, and wood.

Phosphates produces fecundity; fruit—stone fruit in particular—set better, wheat and corn crops grow heavier ears, furnished with plumper grain.

Potash produces starch, and also sweetness and flavour.

Gypsum and sulphate of iron cause the fruit to hang better on the tree and give tone to the plant.

An *abundance of nitrogen* is indicated by rank growth and dark green foliage, and by size and coarseness of fruit. Conversely, stunted growth and pale leaves often show lack of nitrogen. Fewer fruit are formed; these are of smaller size and colour early. On oranges, excessive organic nitrogen results in thick rind, abundant rag, and sometimes in causing die-back and gumming diseases.

Lime and potash correct the effect of heavy doses of organic nitrogen.

Mineral nitrogen stimulates the production of fruit more than excessive applications of *organic* nitrogen. In oranges, thinner skin and little rag or fruit pith is produced; sulphate of ammonia, when there is a slight deficiency of potash, tends to sweeten the fruit.

Phosphoric acid starvation is at times manifested by the appearance of the young and tender leaves known, as "frenching" or variegations of the foliage. It throws the tree into fruit quicker, and has a most beneficial influence on the growth of the plant.

Potash fertilisers are not sufficiently used by fruit growers, considering what an amount of this element is found in the ashes of fruit.

Heavy doses of potash unless correspondingly accompanied by other fertilisers produce sour fruit. Lack of potash is shown by spindly growth of wood, which summers badly and is easily injured by frost. On account of its deliquescent property its application often aids the plant to withstand the heat at that time of the year. On account of this temporary drought a great quantity of fruit often drops off soon after it sets.

Lime is notable in its effect on table grapes. It also tends to hasten the ripening and to perfect the colouring of oranges. Deficiency of lime is often accompanied by thick skin and poor aroma.

PLOT EXPERIMENTS.—We have now an idea of what physical features a fertile soil must possess.

Chemical analysis, moreover, throws, on the quantities of plant food such a soil possesses, a good deal of light, and tells us whether any of the essential constituents of that store of plant food is abundant, is deficient, or is adequate for the needs of the crops.

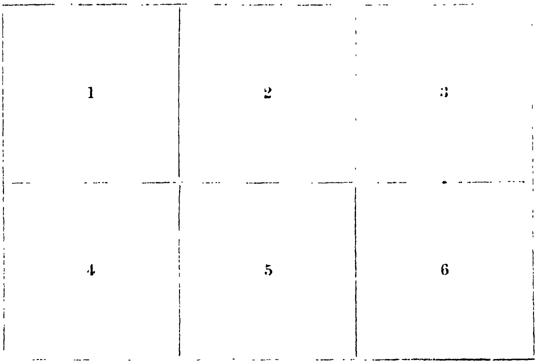
Chemical analysis, however, is not sufficient. It merely gives us an indication—a most useful indication it is true—but one which it is often desirable to corroborate and to check by actual field investigations.

In experimental plots we have a ready means of solving agronomic problems tending to the production of heavy crops at the least possible cost.

The owner of a place, especially one acquiring a farm and knowing nothing of the previous treatment of the land or of the capability of its soils, would, in the course of a season, gain a complete knowledge of the requirements of each field by means of small experimental plots. The plots need not be larger than one-quarter acre, while plots one-eighth of an acre or one-sixteenth of an acre can be made to answer very interesting questions, which, interpreted in £ s. d., would prove of great value to the owner.

In order to test by crop growing analysis the requirements of a soil in manures, six plots at least are necessary. These plots must be on ground representative of the land to be tested. They must receive, as regards cultivation, precisely the same treatment. They must be sown with the same seeds, treated in the same way, and sown to the same depth on the same day, and at the same rate to the acre.

In a word, all conditions on every plot must be precisely alike, except the one of manuring.



The plots having been carefully measured, are numbered from 1 to 6, and manured as follows:—

Plot 1. No manure.
,, 2. F.Y.M.; 20 tons per acre—complete organic manure.
,, *3. Complete mineral manure, nitrogen, phosphate, potash.
,, 4. Same as No. 3, less nitrogen.
,, 5. ,, ,, phosphates.
,, 6. ,, ,, potash.

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* Nitrate of soda or sulphate of ammonia at the rate of 2cwt. to the acre.
Superphosphate of lime at the rate of 3cwt. per acre.
Kainit (potash salt) at the rate of 2cwt. per acre.
In plot 4, omit nitrate of soda or sulphate of ammonia.
In plot 5, omit superphosphate.
In plot 6, omit kainit.

If crops of Group III. or IV. mentioned above are used, force phosphate or potash by doubling the dose of these manures.

F.Y.M. is ploughed in, the others put in with the seed.

Nitrogenous dressings split into two dressings, the second in the spring.

HOW TO READ RESULTS.—1. Does the soil want manure at all? Unmanured crop No. 1 should give about as good a crop as any of the others.

2. It wants manure. Plots 2 and 3 both give good crops. According to season and soil F.Y.M. or mineral manures will give a more decided answer.

3. If No. 3 is decidedly better than plots 4, 5, and 6, complete manure is required, and you cannot without loss leave out nitrogen phosphates or potash.

4. If Nos. 4, 5, or 6 is as good as No. 3, then one ingredient in the complete manure may be left out in manuring that crop, as there are indications that the soil is well supplied with it.

5. If two of the plots only, 4, 5, 6, are as good as plot 3, then the soil lacks only one ingredient, indicated by the only bad crop. If plot 4, nitrate is required; if plot 5, phosphate is required; if plot 6, potash is required.

WHEN AND HOW TO MANURE.—Pastures should be manured by applying the fertilisers broadcast at the beginning of the rainy season.

Cereals, viz., wheat, oats, and barley, are best manured at sowing time, either by broadcasting or drilling the fertilisers. Mineral nitrogenous salts should not, however, be applied until late in the winter or spring, when they may be applied as a top dressing.

Experience will teach how to regulate the spread of any definite quantity of manure over an acre of land.

The following rule-of-thumb practice if found to be fairly correct for such fertilisers as potash salts, and nitrate of soda, sulphate of ammonia, or any fertiliser of approximately the same weight.

In broadcasting, sow a handful at each step as the right foot steps forward, and scattering it 12 or 15 feet in breadth, there will be applied 150 to 200lbs. per acre.

When manuring with non-soluble fertilisers, fruit trees, vines, and permanent crops sown in rows, do not sow broadcast, as manure on the surface encourages rank weed growth, and favours the superficial roots at the cost of the deeper ones. A better plan is to set the plough to its full depth of 9 to 10 inches, and open a furrow up and down the centre of the land between the two rows of trees or vines, and sowing in these deep gutters the amount of insoluble fertiliser it is meant to give to each acre of land. When this is done, the plough is again set to its proper depth and the

time to time been added to until there is now an area of fifty acres under fruit trees. About four years since, a change of ownership took place, Mr. Thomas Price, formerly of the firm of Harper and Price, of the Woodbridge Nurseries, becoming largely interested in the property of which he has been manager ever since. Mr. E. H. D. Smith is the other partner principally concerned, and Mr. L. White still retains an interest in the estate.

The orchard is situated in a valley on both sides of a small brook, which originally followed a zig-zag course between two heavily timbered hills. To allow of the more convenient working of the orchard, however, the course of the brook has been straightened, so that it now presents no obstacle in the way of cultivation. The land on which the orchard now stands was originally covered with a very heavy growth of timber, consisting of jarrah, blackbutt, red gum, blackboys, and a veritable tangle of under growth. The clearing of the land, therefore, has been a difficult and costly business. During the time Mr. Price has been in charge, over 20 acres have been cleared and planted, the average cost for this area from the commencement of clearing operations until the trees were planted being £34 per acre. As Mr. Price raises all his own stock, the cost of the trees is not included in this amount, so that the complete cost of planting an orchard in this part of the country may be put down at £40 per acre. While this may seem a pretty heavy outlay to commence with, undoubtedly good value has been received for the expenditure in the case of the Illawarra orchard. Mr. Price, who came into the management of the property with a thorough knowledge of the proper methods to adopt to ensure success in the fruitgrowing business, is a firm believer in the wisdom of doing everything well, and while as keen on getting twenty shillings for a pound as any man, does not scruple to spend the pound when it appears necessary. The way in which the land is prepared before planting is a model which might well be set up as a standard for those who intend planting to copy. After the timber has been burned off and the holes filled in, the ground is ploughed very lightly, the idea being to reach just through the mat of fibrous roots which is found near the surface wherever the land is covered with small growth. After ploughing, the sod is thoroughly broken up by the repeated use of harrows and scarifier. Then the land is ploughed crosswise to a greater depth, and the ground again broken up. This process is continued until the land has been ploughed four times and a depth of a foot reached. The result of this is that the whole of the soil has been brought into a nice condition of cultivation, and thoroughly exposed to the sweetening influence of the sun and air. Consequently, the young trees commence to grow from the jump, and never suffer the stagnation which characterises the growth in many instances where the ground is newly cleared and "sour." Another very noteworthy feature of the method followed by Mr. Price in laying out his orchard—and one which is unfortunately too rarely considered—is the question of drainage. Although the slope of the land on which the orchard is planted might be considered sufficient to insure surface drainage, Mr. Price considers underground drains an absolute essential, without which satisfactory results cannot be counted on. Wherever the ground appears wet or water-logged, box drains are put in before the trees are planted, and if, after planting, the trees seem to be suffering from an excess of moisture, drains are put in to remedy the trouble, and the result never fails to give complete satisfaction. The method of constructing the drains is sufficiently simple and inexpensive to warrant description. An excavation two feet six inches wide at the top and tapering to a depth of two feet is made. At this depth the channel is deepened another foot to the width of the spade. If the subsoil at this depth is of a solid consistency, and therefore unlikely to cave in, an old sleeper or rough slab is laid over the narrow channel formed by the excavation of the last spit, and the earth filled in on top. If the subsoil is likely to break away and block up the channel, it becomes necessary to use three slabs, two being placed on edge and the third laid flat on top. This latter class of drain is practically indestructible if sound jarrah timber is used in its construction. In all there are over three miles of underground drains on the orchard, and Mr. Price puts the cost at from fifteen shillings to seventeen shillings and sixpence per chain. In some of the spots where the trees are now thriving beautifully, before the land was drained it used to be almost impossible to take a team of horses over the land in the summer. Now the horses can be taken over any part of the orchard in the winter without being bogged. In addition to the underground drains, there is a good open drain cut right around the outside of the fence enclosing the orchard. All storm water is thereby diverted from the cultivated land, so that the soil is not liable to be washed away or scored with unsightly channels.

The quality of the soil is very similar to that found in the valleys and gullies throughout the ironstone ranges. The soil along the course of the brook is a rich chocolate alluvial, and the higher land is of a lighter and more gravelly character. Apparently the whole area is underlaid by a good strong clay subsoil at a moderate depth. The supply of moisture is of course ample, for the rainfall in this locality is particularly heavy. There are no official records of the rainfall in this locality during the past two years, but for the five preceding years the average was over 42 inches. As this is distributed well throughout the year it follows that irrigation is not attempted in this orchard. In the application of manures Mr. Price deals liberally, but not wastefully, with his trees, and expects always to get more than a fair return for the manure applied. When planting, each tree is given 2lbs. of bone dust, which is thoroughly mixed up with the earth around the roots, and I might here digress to state that the trees are not planted in pot holes, which frequently prove the veriest death traps, but the soil is worked thoroughly throughout as described at an earlier stage. When planting time comes, just sufficient of the loose earth is moved to accommodate the tree, and the roots are therefore free to penetrate in all directions. After planting, the trees receive no more manure until they reach

One of the Cleopatra Apple Trees (nine years old) growing at the Illawarra Orchard.

the bearing stage. A mixture of bone dust, superphosphate, sulphate of potash, and sulphate of ammonia is then applied at the rate of 6cwt. per acre, and repeated every third year. The dressing is applied over the whole surface of the ground and where it cannot be ploughed in it is worked over with the spade.

In the matter of cultivation a very high standard of excellence is reached. The trees have, of course, all been set out in proper order to allow of the maximum amount of work being done by horse power, and wide headlands have been left for turning teams and implements. It is, therefore, only by the grossest carelessness that the horses and cultivating machinery can be brought to do the trees any damage. In the autumn the soil is thoroughly ploughed up, and the spring tooth scarifier and harrows suffice to keep the soil in good tilth and absolutely free from weeds at other times of the year. Not only is the land among the trees kept free from weeds, but the headlands are also carefully scarified to prevent the growth of rubbish.

Of the area planted, over half consists of apple trees, and it is doubtful if more prolific trees, for their ages, are to be found anywhere than those at Illawarra. As an example I might quote that 100 cases of first class fruit were gathered from five nine-year-old trees of the Five Crown variety last season. When it is said that these apples were never worth as little as 10s. per case, the returns from these trees read very well. Though the yield just quoted was a particularly heavy one, the same trees had borne a big crop the preceding year also, though there is but a light crop on them this season. From present appearances, however, it looks as if some trees of the same age, of the Cleopatra variety, are going to make a big bid to eclipse even this record. These trees are simply loaded with fruit, and though the trees are fairly surrounded with props, many of the limbs are now hanging to the ground with the burden of the fruit. With regard to the value of the different varieties of apples, Mr. Price practically places the Cleopatra first, and the rest nowhere. All the young trees planted since he took charge of the place are of this variety, and the appearance of the one and two-year-old apples are well worth going a long journey to see. There is not a solitary miss among the whole lot, and a more even or stronger lot of trees I have never seen. Before last pruning season I measured the growth on some one-year-old Cleopatras, and many of these had made 7ft. of wood during the season, while I dare venture to say that out of about a thousand trees, not one had made less than four feet of good, strong growth. The advantages claimed by Mr. Price for this variety—and he has abundance of argument in his orchard to support his opinion—are its strong and rapid growth, early and constant bearing characteristics, and the high quality of the fruit. This kind also attains a large size, and thrives well on light as well as the richer soils. Among the other varieties are: Five Crown, Jonathan, Dunn's Seedling, Rokewood, Esopus, Spitzenburg, Rome Beauty, Yates, and Newtown Pippin. Originally there was a much larger variety of apples in the orchard, but Mr. Price prefers to have a few of the best kinds only, and the unsatisfactory sorts have all been worked over to one or other of the kinds named. A large number of different kinds simply make the trouble of picking and packing greater without yielding any benefit. Next to apples, oranges and lemons are most largely grown at Illawarra, and already a very enviable reputation for the quality of the fruit has been established. The oranges grown are chiefly of the Washington Navel variety. While the trees do not promise to grow to such a great size as is reached in the more northern parts of the State, they yield abundant crops, and the fruit is of great size and splendid flavour. As it is not necessary to resort to irrigation to keep the trees going through the summer, it is probable that the trees will last longer, and be less subject to damage during dry seasons, than in localities where surface irrigation has to be relied on for a supply of moisture. The lemons grown are all of the Lisbon variety, and are regarded as among the most profitable trees in the orchard. Last season Mr. Price cured the whole of his crop by a handy and inexpensive process of his own devising, with such success that he was able to put on the market a first-class article, which he proved would keep from May to Christmas. As orange and lemon trees throughout the State are so generally affected by scale insects, it is interesting to see that in this orchard they are kept down to a minimum. When Mr. Price assumed control of this orchard four years ago, the citrus trees were very dirty with the black scale, which not only seriously interferes with the growth of the tree, but greatly lessens the value of the fruit on account of the sooty coating it causes the fruit to be affected by. So severely were many of the lemons infested, that some people did not scruple to tell Mr. Price that it was impossible to cure them. Knowing the habits of this noxious insect intimately, Mr. Price commenced a vigorous crusade against it, first thinning out the trees to allow the light and air to have free access. The spray pump was then got to work and a war of extermination entered upon with the result that the leaves, fruit, and bark of the trees now look beautifully clean and bright, and it requires a diligent search to find any of the scale at all. It is only by unceasing watchfulness and diligence that this satisfactory condition of affairs can be maintained, and Mr. Price keeps a watchful eye on his enemies, and when they appear they are promptly met by a warm reception in the shape of resin and caustic soda mixture, which is found to satisfy the most exacting scale insect. If necessary the application is repeated, but on no account is the scale allowed to obtain a mastery. Among other fruits grown are pears--principally Bartletts--and a small lot of Brigg's Red May peaches. This variety fruits well in this district and strange to say ripens earlier than in the lower and warmer localities nearer the coast. Mr. Price is no believer in having a large assortment of fruits in his orchard, considering it better to concentrate his attention on a few kinds. Originally there were a number of cherries and some plums planted which did not fruit well, and these have all been grubbed up and replaced by apples. When a tree persistently

A Five Crown Apple Tree, growing at the Illawarra Orchard.

A Naval Orange Tree, growing at the Illawarra Orchard.

refuses to bear in spite of proper cultivation and treatment, the best thing to be done is to replace it with something which will repay the cultivator for his labour. During the past year over 70 tons of fruit was despatched from this orchard to market, and the conveniences for handling the crop are excellent. The fruit, when gathered, is taken to a large packing shed, where it is sorted, packed, and labelled ready for market. In this shed the cases are made and stored ready for use. New cases only are used; for not only is the danger of introducing diseases by means of second-hand cases recognised, but Mr. Price considers the extra cost of new cases is amply recouped by the better appearance of the fruit packed in them, and the better price realised. The material for the cases is purchased in shooks, and the cases are put together on wet days when the men cannot be usefully employed outside. With such a large quantity of fruit as is harvested in this orchard, it would not be taking the fullest advantage of the market to send in the whole crop at once. A storeroom, capable of holding 2,000 cases, has been built to accommodate the fruit while it is being placed on the market. This room is cheaply constructed of double weatherboard packed with sawdust, and being built in the centre of a large shed, the temperature is always cool. Mr. Price estimates that the cost of the storeroom was more than returned the first season owing to the facility provided for keeping the fruit until late in the season. With a good cool room for storing them in, such varieties as Yates and Rokewood can be kept right through the season.

The buildings on the property are all substantial and serviceable. Unlike many places, neat and comfortable cottages are provided for the men employed on the place. A plot of land is given to each employee if he wants it, on which to grow vegetables for his family; but if he fails to keep the ground free from weeds, this privilege is taken from him. The general appearance of the property is most pleasing and attractive. Good fences and gates are a feature of the place, and the approach to the homestead is planted with pines. The homestead, a neat and comfortable structure, is situated within the orchard, and is adorned with beautiful creepers and passion vines. In the flower garden surrounding the house are to be seen a splendid collection of the newest and most beautiful roses, chrysanthemums, and carnations. The flower garden and house are surrounded by an exceedingly trim and attractive hedge of *Mirbelia dilatata*, a native shrub found growing in the gullies in the neighbourhood. This plant grows readily from seed, and when kept trimmed makes a very close and handsome hedge, which from its novelty alone is sure to attract attention.

While the Illawarra orchard is an exceptionally successful and well-kept one, there is certainly no reason why the same results should not be obtained in other spots in the same locality, for there are plenty of gullies among the hills which are equally as suited for fruitgrowing as the one I have described. One circumstance, however, stands largely in the way of the development of the district. The more than unsatisfactory nature of the railway service on the Canning timber line is an obstacle that occasions great trouble and loss to settlers along the line. There being no stated time-table to which trains run, a load of fruit may be carted to the line and kept waiting for hours without any shelter from the sun; the fruit therefore suffering in value and the settler losing valuable time. In the matter of charges on goods and produce, the settlers are very heavily taxed, in some cases the railage on goods from Midland Junction to the terminus of the line being as much as the stuff is worth. Under the circumstances it is easy to realise the importance to the settlers and district of the Government assuming control of the line. In the fruitgrowing business, at any rate, it is imperative that a certain and ready means of transporting one's stuff to market should exist; and until the railway service on this line is greatly improved, the advance of this district is likely to be retarded.

The illustrations appearing in this article are from photographs taken at the time of my visit by Mr. G. C. Baker, the editor of the *Journal*. They explain themselves.

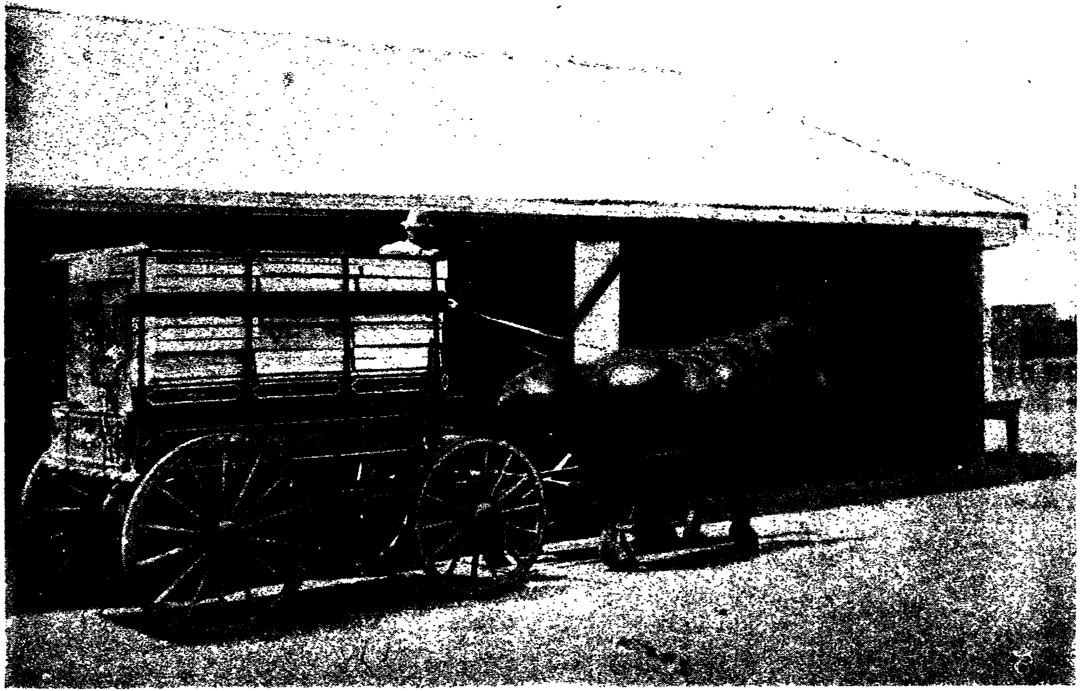
THE GOLD MINE NECTARINE.

The following note was sent by Mr. Despeissis, the Horticultural and Viticultural Expert of the Department of Agriculture, to Mr. J. Hawter, proprietor of the Blackwood Nurseries, Mullalyup:—

"The specimens of the Gold Mine Nectarines you sent me reached me in very good order, and have been much admired. I am having a model made of the fruit for our departmental collection.

"This nectarine ripens the first week in February. It is of large size, measuring $2\frac{1}{8}$ to $2\frac{1}{4}$ inches long by 2 inches in breadth, and is slightly oblong. The colour, which is at first cream, is abundantly suffused with bright red, turning to a darker red. The flesh is abundant, cream in colour, sprightly, and of excellent flavour. The fruit is free stone.

"The Gold Mine Nectarine is one of the best in cultivation. I am growing it myself, and find it a strong and hardy grower. The trees have, so far, fruited regularly."



Wagon load of fruit leaving the Illawarra Orchard.

THE CODLIN MOTH IN AUSTRALIA.

By A. Despeissis.

The codlin moth, like the great majority of pests of fruit trees and cultivated crops, has, by the disseminating channels of trade and interchange, been at various times transferred from one locality to another.

Western Australia, with its long time isolation and its scant population, stood, until lately, out of those channels of trade and interchange. As regards apple production, local requirements were then abundantly supplied from local sources, and, therefore, little or no chance was offered for the introduction of that pest.

With the inrush of population, which followed the advent of that area of prosperity which opened for this State some twelve years ago, conditions changed, and trade and interchange became brisker. With much foresight, the Government of the day, realising the immense loss which the codlin moth inflicted upon apple orchards in the Eastern Australian colonies, and realising also the great capabilities which Western Australia offered for apple-growing, wisely decided to absolutely exclude the introduction of apples, pears, and quinces within the South-Western part of Western Australia as the only means of preventing the introduction of the codlin moth. This step, in the opinion of every competent authority, was the only efficacious one for keeping the moth out of the State. For over 10 years this regulation was strictly enforced, with the greatest possible measure of success. During all that time the codlin moth, which was destroying from 25 to 50 per cent. of the apple and pear crops of some Eastern growers, was never allowed to enter this State. This barrier proved a powerful stimulant to apple-growing, and the acreage under *pome* fruit increased from 933 acres in 1892 (the first year returns were compiled) to 3,235 acres in 1901, of which two-thirds were not bearing.

During that period the population increased by leaps and bounds, and although planting kept pace with it, or even overgrew it, yet so much impatience was shown on the part of the newcomers at the inability of the rising orchards to supply from the outset cheap apples in abundance, that the cry raised by a few fruit importers and others, who find a fresh grievance in every single action contemplated for the benefit of the greater number, was taken up by the miners and the townspeople and turned into an electioneering weapon.

The introduction of apples, pears, and quinces followed. From that date the appearance of the codlin moth in our midst only became a matter of time. About the middle of January last some local apples were seized at public auction with codlin moth grubs in them. The Department of Agriculture promptly traced the source of infestation, which proved to be a small garden in the heart of Perth, where some few dozen wormy fruit were discovered and destroyed. The trees were duly bandaged, and the locality is kept under strict supervision.

An active inspection is being carried out in Perth, in order to discover whether fresh outbreaks exist. It is of the utmost importance that in regard to this search for the moth, growers should join, and in order to enable them to become better acquainted with the pest they are threatened with, the following notes, published a couple of years ago, are, to a great extent, reproduced in this issue:—

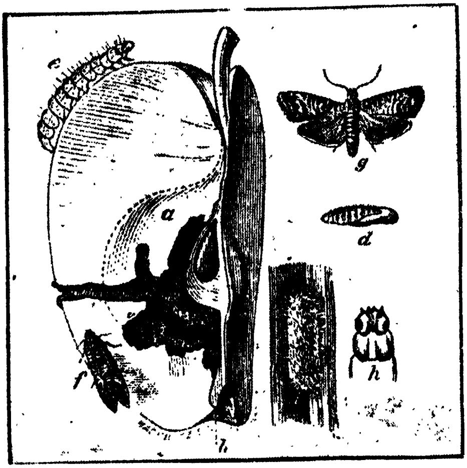
As the question of the possible introduction of this pest has now become a topic of conversation, which is warmly taken up by orchardists all over the State, I have carefully gone through the published experiences of well-known observers, both in the Eastern States and in America, and have sifted, from the mass of information thus gathered, much that may be of use in imparting to apple-growers a knowledge of the habits and the peculiarities of the codlin moth. Amongst the latest exhaustive reports on this orchard pest is one contributed by Mr. A. M. Lea, once Entomologist to this Department, and now Government Entomologist of Tasmania, and another one by M. V. Slingerland, of the Cornell University Experimental Station, U.S.

Apple culture is recognised as a national industry in Tasmania, and Mr. Lea has devoted himself with all the earnestness that the question demands in dealing with this subject. From that report I shall cull much of the up-to-date information concerning the habits of the codlin moth in Australia.

Just as in the course of a few years the oïdium of the vine swept vine-growing out of existence in Madeira, and then threatened the vineyards of the world, just, also, as the dreaded phylloxera for a time devastated the vineyards of France, so the codlin moth has of late inflicted incalculable loss to Australian orchardists. As patient and laborious observation have thrown light on the mysterious spread of the two scourges of the vine-growers, and led to their being kept in check, so it is not unreasonable to predict that a better understanding of the habits and behaviour of the codlin moth may some day lead to methods which will better check its spread. Since light has been thrown on the habits of the codlin moth, it has become more apparent that, instead of raising barriers against its dissemination over the Australian fruit-growing areas, our present fruit and produce marketing methods have offered every facility for its distribution, even to the most isolated and the most distant orchards. Second-hand fruit cases have been the bane of fruit growing.

DESCRIPTION.

The codlin moth (*Carpocapsa pomonella*, Linn.) is so called because in Europe it mostly attacks the early culinary or "coddling" varieties.



a Piece of an apple, showing the work of the larva. *b* Point of entrance of the larva. *d* Pupa. *e* Larva or caterpillar. *fg* Imago or moth. *h* Head of larva, enlarged. *i* Cocoon.

The *moth* itself is barely half an inch in length, when at rest, and measures about three-quarters of an inch across the expanded wings. The fore wings are partridge grey, crossed with wavy brown lines, and are ornamented with patches of metallic brown scales near the margin. The hind wings are light brown. The male is supplied with a dark narrow space on the lower surface of the front wings, and a narrower stripe on the upper surface of the hind wings. "These dark spaces," says Lea, "are due to hairs, and are absent in the females."

The *egg* is white, scale-like, and flat. Smaller than the head of a pin, it is not easily seen on the fruit until the young grub has left it, when it soon after falls or is blown off.

The *larva*, or grub, on hatching, is one-sixteenth of an inch in length, and, when full grown, ten times as large, or five-eighths of an inch. It is of a fleshy pink colour, and is covered with a few stiff hairs. "The male," says Lea, "can be distinguished from the female by the presence of a small dark space in the centre of the body, that can be seen through the skin." (The grub of the light brown, or false codlin moth (*Cacœcia*) is chiefly differentiated by its dirty green colour, besides being considerably thinner.)

The *pupa*, or chrysalis, is brown, and about half an inch in length; when empty it is a very pale brown.

The *cocoon* is made of white silk, and is joined to, and more or less concealed by, the bark or bandage, wherever it is placed; it is never loosely placed, and frequently the grub eats a small hollow space for its reception. I have seen these cocoons between the nailed end of the battens and the end or centre board of fruit cases, in places where one could hardly insert the blade of a knife, the grub having practically eaten for itself a hollow chamber where it spins its cocoon.

INTRODUCTION AND DISTRIBUTION.

The codlin moth is as widely distributed as the apple itself. It is a native of Europe, where, owing to the fact that it is there kept in check by climatic conditions, or by natural enemies, it is not so mischievous as it has proved to be either in America or in Australia. It was introduced into the United States, from Europe, soon after the first settlements were founded. In 1774, or a little over a hundred years ago, it appeared in California, and is supposed to have been brought in old fruit boxes. It appears to have been introduced into Australia from California, and was first recorded from Tasmania, forty years ago, in 1861. During that time it has ruined many a fruitgrower, and now levies a most galling tax on most apple-growers in the Eastern States of Australia, as well as New Zealand and Tasmania.

This pest does not attack apples exclusively, but it is also found, although not so commonly, in pears and in quinces. When driven to it the moth also turns its attention to hard-flesh plums, peaches, and apricots. It has been seen (but very rarely) on the cherry and walnut; although reported in the tomato, the grubs have in every instance proved to be the well-known pests of that fruit, the *Heliothis armigera*, or *Mamestra composita*, whose grubs are much larger than that of the codlin moth.

In Bulletin 142, Cornell University Experiment Station, on the Codlin Moth, 1898, by M. V. Slingerland, the following estimation of the amount of damage done by the moth occurs:—"Conservative estimates put the annual loss from its ravages, in all countries where it is noticeably destructive and but little is done to check it, at from 25 to 75 per cent. of the crop of apples. Where modern methods of combatting the insect are practised this percentage is often reduced one-half or more."

The same author estimates that the loss due to the codlin moth was:—

1887—State of Illinois, 2,375,000 dollars (£475,000), or one-half the value of the average apple crop.

1892—Nebraska lost 2,000,000 dollars of apples (£400,000).

1898—New York County, 3,000,000 dollars (£600,000).

Lea, in 1900, estimated the loss annually caused in Tasmania by the codlin moth at £30,000, "this, however, is probably far below the mark."

"A loss in an orchard of 50 per cent. is by no means uncommon, and I have myself," says Mr. Lea, "seen an orchard near Launceston, every apple in which was struck, and many of which contained two, three, or four grubs. From an orchard near Hobart as many as 11,000 infested apples have been picked to the acre." At five apples per pound this would give 2,200lbs., and at 40lbs. of apples to the case, 55 cases of grubby apples per acre.

Western Australia, as already stated, was not until quite recently known to have the codlin moth, and this was entirely due to its comparative isolation, and to the wise legislation introduced twelve years ago, and prior to the introduction of Responsible Government. The measure, an Order-in-Council, under date 7th March, 1889, absolutely prohibited the importation of apples, pears, and quinces on any point of the West Australian coast South of Champion Bay and the port of Geraldton. The late Bureau of Agriculture has often been given credit, or has been abused, for this wise piece of legislation, but it is seen that the Order-in-Council was enacted some five years before the Bureau was constituted.

On the 5th July, 1901, another Order-in-Council revoked this order, and since then the prohibition of apples, pears, and quinces has been removed.

LIFE HISTORY IN AUSTRALIA.

Apple trees blossom in Australia from the last week in September to the end of October, and a week or two after the opening of the petals the first codlin moths issue from the pupæ or chrysalis, and the males and females mate. The proportion of these is fairly balanced. From observations made, the female lays 80 odd eggs. The mother moth flies about at dusk, or even earlier in the day if the weather is cloudy, and lays one egg on each apple (if more than one grub is found in the fruit then the eggs have been laid by different moths); that egg is more frequently deposited about the eye, but it is sometimes seen on the stalk, or even on leaves.

The eggs are sometimes infertile, especially in cool, foggy localities, where the parent moths either fail to mate or on account of the egg not having sufficient warmth to hatch. The first theory is the more likely under Australian conditions. During the egg-depositing period the moths are said to fly long distances in search of a suitable place to lay their eggs, and are often carried in the direction of the prevailing wind.

The eggs hatch in from seven to ten days, and the young grubs grope about nibbling at the fruit, generally about the eye where they have their first few meals. Shortly after they strike the apple and effect an entrance into the fruit, generally in the eye, but at times from the side or at the place where two apples touch, or where a leaf is resting on the fruit. Once the fruit is struck the young grub goes on tunnelling towards the core of the fruit, coming back to the entrance to void its castings, and afterwards leaving them in the tunnel. It soon reaches the pips, one or more of which it eats, and then, in about a month's time, when full fed, it carves a tunnel out for itself, generally on the side of the fruit, but sometimes, although rarely, along the same channel it cut when entering into the apple. This channel is not always visible from outside, but when the apple is cut into often becomes noticeable.

When full fed it either comes down with the fruit which drops prematurely, or it lets itself down by means of a silky thread, and it then proceeds to seek shelter. This it finds in most cases under loose bark on the trunk or the main limbs of the tree itself or on adjoining trees, or on fencing posts, under heaps of rubbish, among empty cases, potato bags, or other packages, in the cracks of adjoining buildings, in piles of rubbish, or under dry clods; it has even been seen in the tails and manes of badly groomed horses. Once secreted it spins for itself a protecting cocoon, and after a time, varying from a few days to as many weeks or even months, it metamorphoses itself into a pupa or chrysalis, when it remains in that state for 10 or 20 days, after which it emerges into a perfect insect.

It is thus seen that when the circumstances lend themselves to its uninterrupted evolution during the warmer months, the codlin moth takes 40 to 50 days to pass through its metamorphosis; it often takes much longer. Lea, and with him other careful observers, state that the full-grown grub or larva is, on the other hand, often weeks operating its transformation. It often lies in a semi-comatose state, curled up within its web, all through the autumn and the winter, before it changes into a pupa or chrysalis.

The theory of multiple broods through the summer months is now fading away under the light of modern observation. A certain proportion do metamorphose into moths again during the season, but the majority of grubs pass the winter without changing to pupæ. Lea and others affirm that in most cases only one brood is hatched during the season.

Just as all the grubs or larvæ do not pupate all at once, so, during the apple season all the moths do not come out at the same time. "Those in the gullies," says Lea, "will come out later than those in the open, and those on the sunny side of a tree before those on the shaded side."

This irregularity has led many people to think that the moth was double-brooded in Tasmania and other Australian States. The test of complete absence of empty chrysalis cases (not cocoons) in the bandages during January and February is, in Lea's opinion, conclusive evidence that in Tasmania there is but one brood to deal with.

OUTWARD SIGNS OF WORMY FRUIT.

1. A careful examination of a wormy apple often shows in the locality of the calyx, or the eye, a minute puncture surrounded with the castings of the young grub, more or less entangled in silky web. In some apples this is more apparent than in others.

2. Frequently, when the apples are growing, a brownish, gummy substance may be seen oozing from the eye, and this substance invariably denotes the presence of a grub.

3. When the hole is made in the side, this gummy substance is very seldom seen, and the hole is generally covered with web, to which small particles of excrement adhere. After the grub has left, the hole is generally left partly uncovered, and the excrement (which is frequently matted together with web) rapidly turns

mouldy, but it appears never to turn mouldy when the grub itself is present.

4. Wormy fruits often colour and show signs of ripening a fortnight or more before healthy ones, and they will frequently drop. Soon after they strike the ground, and often within a day or so, the concussion will urge the grub to come out.

5. When the grub has made its exit a noticeable hole is seen on the fruit.

HOW TO FIGHT THE CODLIN MOTH.

1. The first essential of a successful attack against the codlin moth—and, for the matter of that, against all manner of plagues, blights, and pests—is concerted action.

2. Where an outbreak first takes place in a clean country or district, the readiest and most reliable way of stamping it out is the *starving out* method. This, when carried out with no half-hearted manner, is unquestionably the best means of coping with an outbreak. Thus Mr. Th. A. Tabart, then Chief Inspector under the Codlin Moth Act in Tasmania, in his annual report, published 12 years ago:—"I still hold the opinion (which is that expressed by practical orchardists, and some whose very livelihood is dependent on the success of the fruit industry) that the pickings of the *whole of the fruit* from the orchards where infection has been present during the preceding season must be adopted if any permanent good is desired. It daily becomes more patent that eradication will not be complete from simply picking a portion of infected fruit, leaving a large percentage unpicked, in which the grub is developed and allowed to escape."

3. "An ounce of prevention is worth a pound of cure." Never use second-hand fruit cases.

4. The life-history sketch of the moth indicates that each female moth is good for 80 eggs or more, half of which are females. It thus becomes apparent that every worm, or every moth, destroyed at the beginning of the season is worth a great number later. Every effort should then be directed towards their destruction in the early spring. With this end in view, all apple-sheds or storerooms should be thoroughly disinfected by means of hydrocyanic acid gas, sulphur fumes, or hot steam. Every apple storeroom should be made secure against escape of the moth; for this purpose wire screenings should be placed over the inner doors and windows, which should fit well. No fruit cases, either put together or in shooks, should be tolerated in storerooms or fruit auction marts.

5. The apple orchard should be free from rubbish heaps. Wire fences are less subject to harbouring the grubs than wooden ones. The ground should be kept well cultivated and clean, and the older trees should have the loose bark scraped.

6. In badly infested districts in Tasmania, which, by the by, has grappled with the codlin moth question with more thorough-

ness than have yet the other Australian States, "it has been found necessary to so prune the trees as to allow the pickers to see into any part of them; also to keep the trees low, as it is, of course, much more difficult to go over high than low trees."

7. All windfalls in infested localities should be gathered as fast as they come down, as, unless this is done, the wormy apples will, after the concussion they have received, be soon deserted by the grub. This should be more particularly attended to in January, February, and March.

8. Night-light traps, with a lantern hung over a tin tray containing some sticky substance, have been recommended, but the great majority of observers now admit that the codlin moth is not attracted by light, and that when a few odd ones are thus caught the event is more of the nature of an accident.

9. Traps with fresh apple juice sweetened with sugar or honey have been tried in South Australia, New Zealand, and Tasmania with more or less success. Lea used such traps in February and March, and "so far as the codlin moth was concerned, they were total failures. Possibly," says he, "if used in December and January they would have been more successful."

10. Arsenical spraying is, of all the weapons used against this pest, one of the most deadly. It aims at depositing on the surface of the young apple, pear, or quince—and in such a position where it is likely to be picked up by the young grub soon after it hatches—a bait which will prove fatal. A better understanding of the habit of the codlin larvæ enables us to better encompass their destruction.

Observation has taught that the mother moth lays one egg on each apple. Should the egg be a fertile one, and should it escape detection by natural enemies it soon hatches; the young grub then instinctively crawls towards the calyx or eye of the fruit, and there has its first feed or two. It also nibbles here and there at the outer surface of the fruit, and after having a few feeds proceeds to bore into it. It is while thus feeding that it picks up the poison. That poison, it is seen, must therefore lie where it is most accessible. and this is done in this way:—After the petals drop, and as the fruit develops, the sepals which are disposed around the eye, and which, when accompanied by the corolla, are uniformly expanded and spreading, soon assume various shapes, covering more or less the tube which constitutes the calyx cavity. It is before these sepals close that cavity that the spraying should be done, and the most propitious time for this operation is about a week after the setting of the fruit. When this is done a certain amount of the poison is imprisoned within the calyx, where we know that most codlin grubs generally have their first meal. Should, however, the spraying be delayed, the poison will not be deposited within the calyx cavity with the same certainty, and fewer codlin grubs will have a chance of picking it up. Should rain supervene after the spraying it is advisable to spray again in order to get at the later hatched grubs, as all moths do not emerge from their chrysalis stage all at once, but come out from October right on till the middle of summer.

Slingerland, commenting on the results of spraying with arsenites, reports that at least 70 per cent. of the loss commonly suffered by the fruit-grower from the ravages of the codlin moth could be prevented by thoroughly applying the Paris green once or twice in the spring, indeed, "thousands of practical fruit-growers, who have thoroughly tried it, are unanimous in their testimony that from 50 to 90 per cent. in some cases, of the fruit that would otherwise be ruined by the insect, can be saved at a comparatively slight expense." Any of the several arsenical poisons may be used, viz., Paris green London purple, white arsenic, arsenite of lead, etc. Of these Paris green is the best, when unadulterated, and, in the hands of the average fruit-grower, that which is the safest to use.

London purple is variable in its composition and liable to burn foliage. Arsenite of lead is well spoken of by a few. Of all the arsenites, however, Kedzie's solution, named after the Director of the Michigan (U.S.A.) Agricultural College and Experiment Station, is the most reliable, and it does not, moreover, burn the foliage of the trees, and is very cheap in price. It is thus prepared:

White arsenic	2 lbs.
Sal. soda (washing soda)	4 „
Water...	2 gallons

Boil for 15 minutes. Put into a glass jar, label "poison," and lock up. When required for spraying slake 2lbs. of quicklime, which stir in 40 gallons of water, adding one pint of the mixture from the glass jar. It is claimed it is easily prepared and is always ready for use, without deteriorating; it does not hurt the foliage as does arsenic; it leaves a whitish colouring on the foliage, showing how evenly the spraying has been distributed, and is cheaper than Paris green.

A good deal of the unsatisfactory results which have attended the use of Paris green is the result of the adulteration of that chemical. The following test will prove its purity:—Boil one gramme (or 10 to 20 grains) of Paris green, with dilute hydrochloric acid; if pure, it should dissolve completely. If there is a residue, wash well over a paper filter, ignite, weigh and test for barium sulphate, a common form of adulterant. Further tests are used for detecting adulteration of Paris green, and to this I must refer inquirers.

11. Bandages, when well applied and carefully attended to, are better than any of the patent traps yet tried. Next to spraying, the greatest number of grubs can be destroyed by its use, and from 40 per cent. to 50 per cent. of codlin larvæ are said to have thus been entrapped. The bandages are made of wide bands of hessian, about 12 inches wide, and long enough to encircle the stem of the tree. The piece of stuff is folded in the middle and fastened tightly

round the tree by means of twine. If the bole of the tree is fluted and uneven, two bandages, at intervals of a foot or so, one above the other, will offer a more efficient barrier to the ascent of the grub.

According to the regulations at present in force in Tasmania, the bandages should be placed on the trees in November, and finally taken off not later than the following July. They should be removed every eight or ten days and boiled—this boiling also destroys a great many eggs of red spiders—and then replaced. This is preferable and more reliable than an eye inspection of the bands, whereby a certain number of grubs are generally allowed to escape unnoticed. On going over the trees, when the bandages are removed, a pointed probe should be used to search out all grubs which may have secreted themselves under pieces of bark, or eaten for themselves a hiding-place into the bark, broken branches, forks of the limbs, or old scars—as they prefer such places to the bands. Two bands, one over the other, are sometimes used, as some of the grubs, at times, crawl over the first in search of a hiding-place more to their liking. "For a considerable number of trees examined," says Lea, "I found that where the trees had been properly bandaged, four grubs would be found in the bandages to one in the bark beneath them; doubtless in the rougher-barked trees many of the grubs never came as far as the bandages, and, in many instances, more grubs will be found in the bark than in the bands, especially if these cross an old saw-scar." These bands answer a good purpose, but some growers successfully supplement them by placing among the lower limbs and on the ground around the trees, other traps, made of sandwiching a piece of sacking between two shingles, and joining these together with a nail. These traps are easily made and laid, and as easily gathered up and inspected.

Although bands answer a good purpose, they must be applied to other kinds of trees, and even to fencing posts around the apple, pear, and quince trees, to do all the good which may be expected from them.

Mr. George Compère, who has done valuable work in Australia and China for the State Board of Horticulture of California, and who is now attached to this Department, mentions another easy way of gathering and destroying the codlin grub in California. Long straw is lightly scattered about the trees in the summer, and then raked up into small heaps and set fire to.

NATURAL ENEMIES AND PARASITES.

12. "Probably the greatest distributor of the codlin moth is the fruit-grower himself, and the compulsory spray and bandaging in force in Tasmania meet with many opponents," says Lea. "Firstly, from those people who object to being compelled to do anything; secondly, from those who think it useless; thirdly, from those who, on account of their orchard being lightly infested, think it is too expensive to bandage and spray hundreds, or perhaps

thousands, of trees to catch a few grubs." That class of people will always be found in any community, and therefore it is to natural enemies and to internal parasites of the codlin grub that we must look to in order to minimise the tax it levies on infested orchards. It is a fact worth noticing that, in those countries where the apple tree found its birth-place, there Nature has wisely provided natural enemies, whose functions in life is to keep in check those insects which prey on the fruit. In America, in Australia, and in South Africa, where apples, although introduced, flourish as well, if not better than on the continent of Europe, the codlin moth was also introduced, but many of its natural enemies and parasites must have accidentally been left behind. The balance of Nature has in consequence been disturbed, and the moth has been having it pretty well all its own way. Artificial means, such as fumigation, spraying, bandages, and quarantine laws have, no doubt, done good work, but gradually and surely the pest is spreading, and is getting more troublesome. In Devonshire, in Herefordshire, in Normandy, and other localities famed for their apples all the world over, no fumigating, no spraying, no bandaging are practised, and yet there apple-growing continues to be a remunerative and a national industry. It is to these localities that the American, the South African, and the Australian apple-growers will have to look for help, in the shape of codlin parasites.

The Americans are now well impressed with this fact, and they are already out in the field collecting these parasites and enlisting them in their warfare against the moth.

What these natural enemies are is a question of considerable moment for the apple-growers, and a list is here given, many names of which are taken from Mr. A. M. Lea's report.

Birds.—Hens in an infested orchard pick up a great number of codlin grubs and tear them out of their cocoons, in fact they can easily be trained to follow those engaged in lifting the bandages, and are found to be of great assistance. In America, woodpeckers and robins unceasingly seek after these worms during the winter months. In Tasmania, goldfinches, crows, starlings, and sparrows eat enormous numbers of the grubs, the last two, however, in other ways, prove themselves destructive birds. In Germany and other parts of Europe the tom-tits do good work.

Mammals.—Mice, rats, and bats devour many of these insects.

Insect enemies are numerous, of these the internal parasites are amongst the most useful. They include three from Europe, *Campoplex nemorum*, *Pachymerus vulnerator*, and *Phygadenon brevis*. Hair worms (*Gordius*) have been seen in grubs in the United States of America and Europe. From the United States a small wasp (*Trichogramma pretiosa*) is parasitic on the eggs. An ichneumon (*Macrocentrus delicatus*) and a fly (*Hypostena variabilis*) are parasitic on the grubs when in the fruit; another hymenopterous insect (*Goniozus*) is an external parasite, an ichneumon (*Pimpla annulipes*) destroys the pupæ. "In California a wasp

(*Sphecius Nevadensis*) frequents pear trees, and is described as pulling the grubs out of the fruit with its fore foot," says Slingerland. After the grubs have left the fruit more enemies beset them. In America three soldier beetles (*Chauliognatus Pennsylvanicus, C. marginata* and *Telephorus bilineatus*) feed on grubs and pupæ, as well also on a neuropterous insect (*Rhapidia*), and other beetles destroy pupæ, viz., *Trogosita laticollis T. corticalis.* In Tasmania and Australia two common soldier beetles (*Telephorus pulchellus* and *T. ruficollis*) eat grubs. The spotted ladybird (*Leis conformis*) devours young grubs, and even pull these from the fruit when just starting to bore. Ground beetles, and among them (*Gnathaphanus pulcher*), one which occurs in the Eastern States. Bugs of the genera, *Reduvius* and *Pentatoma*, destroy grubs sometimes even before these have left the fruit. Even the much despised earwigs eat numbers of these grubs, and then afterwards will turn their attention to their excrements, and to the apple itself. Spiders and centipedes eat the grubs, and the former the moths as well. Although a long list is here given of natural enemies of the codlin moth, nevertheless the fact remains that many more must exist, and also that they have proved themselves to be inadequate in their isolated efforts in appreciably keeping down the codlin moth. How far their introduction from distant parts and their concentration in codlin moth infested localities will prove effectual in combatting that dreaded pest is a problem which awaits solution at the hands of economic entomologists.

UNFERMENTED GRAPE-JUICE.

By A. Despeissis.

Inquiries have of late reached me from several quarters concerning the proper method of making "unfermented wine." Such an article is, it appears, in demand for sacramental purposes, and a ready sale also exists for using it as a cooling drink.

"Unfermented wine" is, it is only fair to state at the outset, only a snare and a delusion. The word "wine" implies alcoholic fermentation, and so soon as any kind of fruit juice has its sugar transformed into alcohol, through the agency of the living agents of fermentation, it becomes a "wine."

A glance at an analysis of freshly-pressed grape-must will satisfy anyone that no spirit nor glycerine—both residues of alcoholic fermentation—are present. The analysis will also indicate the presence of nourishing and wholesome constituents, which are combined and grouped in a form which is at the same time palatable and wholesome.

The following table shows the several ingredients of fresh grape-juice previous to fermentation:—

Water	80 to 85 parts
Grape sugar (dextrose and levulose)	15 „ 28 „
Free acids (tartaric, tannic)	0·1 „ 1 „
Salts of organic acids (tartrates, malates, citrates of potassium, calcium, etc.)	0·4 „ 0·8 „
Salts of mineral acids, sulphates, nitrates, phosphates, silicates of potassium, calcium, magnesium, iron	0·3 „ 0·5 „
Albuminoid matters	0·3 „ 1 „

Any unfermented wine, therefore, showing substances not mentioned in this analysis must have been tampered with and ceases to be pure grape-juice.

WHY GRAPE-JUICE FERMENTS.

Side by side with the grape-juice, nature has placed active living agents which, when they gain access to that juice, break up and disorganise its several compounds into substances widely different in nature, composition and properties. These living agents are of microscopic size, and although more numerous on the waxy bloom which covers the skin of the fruit, they also float about in the air we breathe, and are present on the surface of all manner of possible vessels and appliances which may be used during the handling of the grape or other juices. These micro-organisms belong to numerous species, and are classified as moulds, yeasts, and bacteria. They differ as regards their shape, their habits, and the resulting produce of their activities. Besides these living agents of decomposition of the juices of fruit, there are present viscous, albuminoid substances which cause a certain amount of turbidity in the liquid and make it unattractive to the sight.

Those two factors, viz., micro-organisms and viscous albuminoid substance are the two elements which the unfermented grape-juice preserver has to contend with, and in order to purge the liquid of them two ways present themselves—one chemical and one physical. The chemical methods consist in paralysing the microscopic cells of the agents of fermentation by means of antiseptic substances. This method is prohibited wherever a Pure Food Act is enforced, and moreover, on hygienic grounds it is strongly to be deprecated, for the reason that such toxic substances which silence and paralyse the living cells of organisms in the sweet juice, on the other hand also happen to injuriously affect those other micro-organisms which accompany and foster digestion. Their use is to be deprecated, and should be prohibited by law.

The physical methods are, on the other hand, safe, and yield results which are quite satisfactory. These are purely mechanical, such as filtering, or both mechanical and biological, such as those methods in which heat, cold, or electricity play the leading part. Of these, heat is, up to the present, both the cheapest and the most reliable.

The germs figured above consist of translucent gelatinous cells which at even a moderate temperature coagulate and perish. The temperature at which these micro-organisms perish is called "the death point" of these microbes. This point is several degrees lower in slightly acid liquids such as grape or other fruit-juice than in neutral liquids. Time is also a factor which influences this death point. For instance, a micro-organism which would only perish if heated for half an hour at, say, 60deg. C. (140deg. F.) would probably survive the treatment if the period of heating was only a quarter of an hour. Then again, micro-organisms occur in two states: an active or growing state and a resting or spore state, the spores being minute nuclei embedded into the body of the micro-organism and endowed with greater resistant properties. This being so, a degree of heat which would coagulate and kill the micro-organism in its gellified or growing state would probably only cause passing discomfort to the more hardened resting spores. As a rule, it requires about 5deg. C. (9deg. F.) additional above the death point of the growing micro-organism to kill the same organism in its resting state. For practice it is found that grape-must or wine is sterilised by heating up to 65deg. to 75deg. C. (149deg. to 167deg. F.). It is essential not to raise the temperature too high, so as not to affect the delicacy of taste or colour of the liquid operated upon, and for that purpose it is essential not to exceed 85deg. C. (185deg. F.).

Whilst it is known that germs of fermentation and of other decomposition organic liquids are destroyed at a comparatively low temperature when immersed in a liquid, these same germs when desiccated can tolerate a much higher temperature with impunity. It is important to bear in mind this fact when bottling the sterilised liquid, as any germs which may be resting on the dry neck of the bottle or on the cork would escape destruction, and would later on start a fresh growth and spoil the liquid. In order to guard against this, both bottles and corks must be boiled just before using. This is done for at least half an hour, and when handling care should be taken not to touch the bottles with the hands high up the neck lest some germs present on the hands should be conveyed to the mouth of the bottles and thence into the liquid.

PLANT REQUIRED.

On a fairly large scale a plant proportionate with the output of unfermented juice would be required. Such a plant would include a steam boiler, a steriliser, or Pasteuriser, to sterilise the juice; a filter press, to separate the clear juice from the viscous pulpy tissue floating in it; a hot-water dip, such as are used at canning works for sterilising the bottles. On a smaller scale a less elaborate plant can be made to answer. An open copper for heating the must and boiling both bottles and corks, a filter, and a bottle steriliser may be made to answer the desired purpose.

MODUS OPERANDI.

The grapes having been crushed, the juice is run into a vat, where it is allowed to deposit its slime. In hot weather, ice or an attemperator may be used to cool it down and prevent it fermenting for a few hours. From this settling vat the partly clarified must is taken to the open copper and heated up to 85° C. (185° F.) for half-an-hour, and skimmed and then run through a cooler into fresh settling receptacles properly sterilised. Steamed casks, closed by means of sterilised bungs, will do. Here much of the albuminoid and viscous matters in the must, which will have been coagulated during the first heating process, are deposited. This renders the operation of filtering much easier. After this the must may be filtered and run into sterilised bottles, which are then securely corked with well-sterilised corks. These bottles are set to stand in a hot water trough, and the temperature gradually brought up to 80° C. (175° F.), at which temperature they are maintained for quarter of an hour. A thermometer placed in one of the bottles indicates the exact degree of heat. It is essential, in order to sterilise the must, that that temperature be reached; whilst, on the other hand, it is essential that it be not surpassed, as a higher degree of heat at the final heating would coagulate a fresh lot of albuminoid matter, which would cause their precipitation and make the liquid turbid.

It is advisable to secure the corks by means of strings during this second sterilisation, in order to prevent them being blown up. When this is done the contents of the bottles will keep for almost an indefinite period, unless some threads of moulds penetrates the corks and contaminate the liquid. To guard against this, it is a good practise to dip the neck of the filled bottles into a 2 per cent. solution of sulphate of copper (3ozs. to 4ozs. blue stone in 1gal. water), and when dry either cover with bottling wax or a capsule. Should signs of turbidity show after a few days, repeat the sterilising process a third time.

Grape-juice thus prepared will, with the exception of a few tinted juice grapes, be white or amber colour, and be possessed with the particular aroma of the grape used in its manufacture,

DISEASE OF APPLE TREES.

Mr. A. E. Laukester, one of the inspectors under the Insect Pests Act, has sent the following report in to the Department:—

In the Wooroloo district, where I have been inspecting this month, the appearance of a number of apple trees in patches through the orchards showing a most pinched and sickly yellow growth could not help being particularly noticeable. These trees, which are in the more dry and gravelly parts, come out in leaf in the spring, fresh and green, and in some cases blossom after growing from one to two inches. They stop and gradually turn a light yellow colour, which remains the same for a month or more; the trees then make a fresh start, growing well from buds two and three feet lower down the stem fom the terminal buds, which on many trees have not burst at all. I can see no disease to account for the bad and checked growth of these trees, neither on the tree or its roots. The latter are in a thick cluster of fine roots, close to the top of the ground round the stem, and are in a very unhealthy state. The owners of the orchards are very anxious to know the cause, and suggest that the Department might analyse some samples of the soil to ascertain whether it lies in that direction. One grower informed me that he had ploughed deeper this year and had used bonedust and other fertilisers, but so far the trees seem to have made no improvement. All the trees affected are in those parts where ironstone gravel predominates and less moisture exists.

The matter being referred to H. and V. expert, Mr. Despeissis reports as follows:

The trees in the orchard referred to, in common with a number of other trees all over the State, have been suffering from what is known as "Die Back," and by some as "*Fruit Tree Rosette.*"

I have examined a great many trees presenting symptoms such as those described without being able to discover any defined disease caused either by insects or fungi.

The same trouble has been noted in seasons, in New South Wales and in South Australia amongst other places, and would appear to be influenced by climatic conditions. It is more pronounced when the surface soil is more shallow and the subsoil not easily penetrated by roots. Lack of nutrition, consequent upon bad preparation of the ground when planting, aggravates it.

Last winter, which was unusually dry, and followed up by a wet spring, would appear to have interfered with the normal running of the sap and caused a drying up of the sap channels or of the root system. The result is noticed in a hardening of the tissues, the bark being hide-bound. Since then, fresh bundles of roots have been formed and fresh growth is showing. Some of this tender wood may not be sufficiently matured when winter comes.

I have failed to notice this complaint in deeply cultivated and well fertilised orchards, and on land which is freely penetrated by the roots of trees. There the growth, although somewhat retarded this season in the spring, has been luxuriant from the start, and no rosette-like clusters of leaves have appeared on the branches.

The treatment should be such as will deepen the feeding area of the roots. The trees should be manured next winter with a few pounds of superphosphate and a dressing of potash fertiliser. In the spring a small quantity of sulphate of ammonia should be given to each tree. It is better to place the fertilisers, in trenches 9 to 10 inches deep, a few feet from the stem.

The hardened, stunted tissues could be cut off when pruning, or should they occur where a limb ought to be, the bark should be slit open the length of the branch, so as to enable the tissues underneath to expand.

The presence of saline matters in the ground would aggravate this trouble. Mr. Lankester might try to procure a sample of some "unmanured soil" in the vicinity of some affected trees, and the analyst be asked to investigate (1) the beneficial substances in that soil, (2) injurious substances in that soil and subsoil.

TOMATO WILT.

By A. DESPEISSIS.

This disease has been unusually prominent on tomatoes this season. The trouble is a bacterial blight. G. Delacroix, a French scientist, who has it under observation, first attributed it to an organism described *Bacillus solanacearum*; subsequent studies have since led him to state that the disease in question is not to be attributed to this organism, but to another apparently undescribed, to which the name of *B. solanincola* is given.

The attacked plants wilt suddenly and after a time leaves and stalks become discoloured and die. If a section is made of the stem, the pith channel is found brown, small warty spots on the stem, not unlike the water core of apples, let droplets of dirty white liquid exude. This liquid is full of bacteria. In potatoes this discolouration extends down the stalk to the tubers, which turn brown and rot. The disease is mostly spread by innoculation caused by the bite of insects; it is also associated with a web-like ground plant fungus, *Rhizoctonia Solani*, which extends its meshes from plant to plant, boring directly into the healthy cortical cells and thus giving an entrance to the bacteriæ.

The first step to take is to spray with a poisonous mixture, and destroy those insects which feed from plant to plant, thus spreading the disease. One ounce of Paris green in ten gallons of Bordeaux mixture will effect this. Carefully dig round the diseased plants and prevent the spread of the web-like fungus to healthy plants. Root up and carefully burn diseased plants.

The organism causing this trouble is believed to be present in the soil from which it spreads to the plants, and unfavourable meteorological conditions are a contributing cause of the infection. Sour ground aggravates the disease.

Tomatoes, potatoes, egg-fruit, black nightshade, Cape gooseberry, among other plants, harbour the germs of the disease, and for that reason should be avoided in the course of rotation over infested ground.

THE JACK (Artocarpus Integrifolia).

The Jack-fruit (*Artocarpus integrifolia*, Linn.) is of the same family and the nearest known relative of the famous Bread-fruit (*A. incisa*). The name *Artocarpus* is derived from two Greek words literally translated, viz., *Artos*, bread; and *Carpos* fruit, and its second name is purely botanical, *integrifolia* meaning entire leaved to distinguish it from *A. incisa*, the cut or incised leaved Bread-fruit.

The Jack-fruit, being of a much darker green, and having very much smaller leaves, and often being quite a different shape and size, the similarity of the two trees will often not be commonly apparent.

There are several allied species, as *A. Lakoochia*, *A. Chaplasha*, *A. Hirsuta*,* about which very little would seem to be known, and which do not appear to have an economic value proportionate to the two species mentioned. The Jack is a native of East India and the South Seas, inhabiting countries with a hot and moist climate, and is essentially a tropical tree. It will not generally thrive in a locality subject to strong winds, as it is somewhat brittle, and will not stand severe frost, though much hardier in this respect than the Bread-fruit.

It is an umbrageous or thick foliaged tree and an evergreen. One tree exists in this Nursery which is thriving particularly well, having readily adapted itself to the climatic conditions obtaining here. An illustration accompanies this article. The tree shown is about ten years old, and 35 to 40 feet in height; it has been in bearing four years or so. During the last season it bore a heavy crop of 50 or 60 fruit, averaging in weight from 5 to 10 or 12lb.

I have observed a few trees here and there in North Queensland, mostly in old gardens where presumably it was grown more as a curiosity than for use; in any case very little advantage would seem to be taken of its useful properties. Several varieties of the tree exist, and some were probably introduced into Queensland at one time, though I have not yet met with more than one variety, which is by no means the best. The better varieties are known as the "Honey Jack" in India and Java, from the sweet syrup that is to be found within the pulp round the seed, and the "Root-bearing Jack," which produces its fruit entirely or partially underground. This latter is a specially fine fruit, and much valued in the Orient. Some writers seem to be of opinion that old trees of the ordinary or "Honey Jack" variety will bear fruit upon their roots in this way, but this is not authenticated. The root-cropping tree is generally considered a separate variety, and though I have seen, sown, and cultivated thousands of these trees, have never yet

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*And in Ceylon *A. nobilis* which gives us a useful timber, and the seeds of which are roasted and eaten. ED. *A.M.*

Jack-fruit Tree (*Artocarpus Integrifolia*).

seen an ordinary Jack that will do this from mere age. This root-bearing may, however, be brought about by artificial treatment occasionally, which methods I will describe later.

Another variety of the species is the "Wild Jack," which is a much larger tree than the cultivated or sweet one. The fruit is smaller, and, though sweet, not so pleasant; the tree itself, however, is more spreading, contains more timber, and as a fodder tree is the more useful of the two.

The fruit of the Jack tree is oval or oblong, is muricated on the rind, and of a bright green colour, turning slightly darker or duller when approaching ripeness, but never becoming quite yellow. When opened it is white inside; the inner pulp or edible parts are separately attached to the centre core, and surrounded by or packed in viscid fibres. Each piece of pulp is about the size of an egg plum, pale yellow in colour, and contains one seed.

The tree, like the cocoa, bears its fruit upon the stem and thicker branches. The fruit has a somewhat strong scent, which is intensified if allowed to become over-ripe. The smell is disliked by some, but on becoming accustomed to it or on tasting the fruit, it ceases to be offensive or even noticeable.

The tree is very prolific, and the fruit often attains a tremendous size and weight—fruit of 80lb. have occasionally been met with. In Southern India I have obtained 50 to 70 fruit from one tree, and myself cut a specimen weighing 70lb.

In Queensland, however, I have not met with any large specimens—the average would seem to be from 5 to 10lb., although one fruit of 23lb. is on record.

The tree comes into bearing here in three to four years, and while large fruit will contain as many as 200 seeds, ten to twelve seeds per fruit is more common. The cropping season is also very short in this State, usually lasting less than two months between January and March.

The fruit is distinctly palatable, and is wholesome an nutritious. The smell, however, is apt to prejudice one against it on tasting it for the first time, and if, in ignorance, an over-ripe fruit is opened, not only is the smell intensified and rendered disagreeable, but the fruit is not so nice flavoured, for, like the Durian, to which it is sometimes likened, it must be taken at the right degree of ripeness to be appreciated.

If these over-ripe fruit are removed or buried, the smell is really no stronger than that of the mango, and not as disagreeable. To judge a ripe Jack-fruit, however, needs a little practice, for one cannot judge by colour. The usual method is to tap the fruit or flip it with the finger, when the hollowness of the sound denotes the degree of ripeness.

The white milky juice, which is very sticky, renders an unripe fruit uneatable, and in an over-ripe one, the stringyness, as well as strong smell, makes it equally unpalatable. An ideal fruit should have the pulp firm, but neither soft nor hard, and a pale yellow colour, when it will be found sweet and of a most agreeable flavour.

In its native countries the fruit is considered a delicacy; natives will pay 1s. to 1s. 4d. each for them, and Europeans become exceedingly fond of them. The pulp may also be cooked in various ways; I have had it boiled in milk, cooked in custards, fried in butter, and preserved in honey. In the latter form it is an excellent dessert. Bernays, in his "Cultural Industries," gives a receipe for boiling in milk, from which, however, the pulp would subsequently seem to be strained off.

In opening a fruit, the rind, which is about half-an-inch thick, should be cut through, and the fruit then broken open. The pulp sacs containing the seed may then be picked out from the surrounding fibres. These should at once be cut open, the seed taken out, and put into a basin of water. The addition of a very little salt to the water improves them, and, it is said, eliminates what little smell may remain. If strained and served up promptly with icing sugar sifted over, they are not only palatable but excellent eating and quite odourless.

However, although it cannot be said that in this case "all love Jack," still all concur in attesting to the excellence of the nuts when roasted. These may be roasted like English chestnuts, which they much resemble, or boiled and used in curries and stews. After being boiled they are sometimes dried and ground, and cakes and nutritious farinaceous foods made from the flour.

The Jack-tree is also useful as a timber tree. The wood is a bright yellow when first cut, and is hard. It soon turns darker on exposure, however, and when old and polished compares very favourably with mahogany in durability, beauty of grain, and colour. From India and the South Seas the timber is sent to England, where it is used for cabinet and furniture making, and largely in the manufacture of brush backs. It takes a very high polish, and works up very like satinwood. In India the wood of the roots is used for carving, and small boxes and articles of this wood, after seasoning and being artificially scented (generally by being packed together with sandalwood), are passed off as of this more valuable wood. The principal use of the Jack-tree in the Northern portion of this State would be as a fodder, and in this way it would probably prove as valuable as the Algaroba or Mesquit Bean-tree. The leaves are readily eaten by stock, and it is a tree that will grow in a dry as well as in a hot climate. In some of the dry parts of India it is extensively lopped annually to feed cattle. The fruit also are greedily eaten by all kinds of stock; pigs and calves are very fond of them. The fruit, however, unless allowed to become over-ripe and drop, should be split open. As a shade tree in paddocks it is always green and cool.

Like all other artocarpads, the Jack exudes a considerable quantity of viscid milky juice, from which the best birdlime is made in India. This sap is also used, mixed with other material, for caulking small boats and canoes. A yellow or kharki dye is extracted from the wood, bark, and roots (and Bernays says, also by boiling the sawdust). As an ornamental tree in tropical landscape gardening, it is in demand, and in farmyards or their vicinity is a grateful as well as a handsome shade, and if used for no other purpose adds considerably to the too little used compost manure heap by its shed leaves and fruit.

As a shade for coffee it is popular in some parts, especially steep land where the soil is a bad retainer of moisture. I have also seen the leaves plaited or pinned together with thorns to make plates for the native's meals of rice, etc. Altogether, the tree is thought highly of, and considered second only to the Bread-fruit in economic value in its native land, where it is one of the few trees left standing and preserved when new scrub land is opened for cultivation.

In India several seeds are often sown together and the young plants subsequently grafted together into one stem by approach, making a stronger and somewhat quicker growing tree. This is supposed to make the tree come into bearing earlier also, but this is very doubtful. Bernays states that whole fruit are planted for subsequent grafting as above. I have not seen this done, but if the whole 100 or 200 seed germinated, the subsequent grafting or inarching must prove a somewhat complicated process. In the same article by Bernays, which is about the best I have yet met with on this too little appreciated tree, a method of growing a long stem is described, which I have carried out with some success. By this method of cultivation the seedling Jack is made to grow up a hollow bamboo till 2½ to 3 feet high: then the stem, which is thin and pliable, is twisted round like a spring or corkscrew—more often in one large circle—on the ground and covered in with earth. This stem grows with the tree, and, if bearing on the stem and branches is discouraged, will often bear on the buried portion of the stem. This procedure is not invariably successful, however. It is an experiment easily made, and the root fruit, if obtained, is so vastly superior to others as to be well worth the time and trouble. The first indication of a root fruit is a slight upheaval of the ground, which subsequently cracks, and before ripening one half of the fruit becomes visible. The root-fruiting tree is, I think, rightly considered a distinct variety. The seed of the true fruit is said to invariably produce true root-bearing stock, which the seed of artificially induced crops will not do, of course.

The Jack-tree is said not to bear at all if the roots reach permanent water; but this also is not authenticated. It may be propagated by cuttings, but seed is so readily germinated that recourse to the more troublesome method is unnecessary. The seed, however, quickly loses its vitality, especially upon becoming dry, and to this cause failure to germinate them can be often ascribed. For seed, the ripest fruit should be taken. Fruit that has dropped from the tree and squashed gives good seed for immediate planting; but, should seed be required to despatch even on a comparatively short journey, fruit not quite ripe should be chosen. Some say, only fruit from the stem should be taken for seed, but I have raised equally good plants and trees from fruit from the branches.

As stated, the seed germinates freely. Frequently, on opening the fruit, especially if over-ripe, the seed will be found to have already germinated, and to have a root 1 to 2 inches long. The spike will be quite small, however, and possibly only just emerging from the germ. But if this root be broken, and it is very brittle, that seed is lost. The seed, which is about 1 inch long and ½-inch in diameter, will be found within a small cocoon-like bag inside the edible pulp. This peculiar bag is quite loose, and feels not unlike thin wash-leather; it should not be removed either when setting for germination or for cooking. Beneath this again is another thin skin, generally red or reddish, and adhering to the seed itself. In roasting or boiling it readily flakes off like the inner skin of a pea-nut, which it resembles in colour and texture.

It seldom takes long to germinate, generally showing up in a few days. As may be gathered from the foregoing, the root growth is especially rapid, and a plant 6 inches above ground will be found to have quite a foot of tap root. When about the size when plants are usually transplanted, it has often too much root to safely allow of its removal without a great deal of trouble. For this reason it is often advisable to set the seeds in the field or where the tree is intended to be allowed to grow. The seedling is very hardy; but if planted out where most useful—*i.e.*, in the paddock—will require guarding for a year or two until out of reach of stock, for they will promptly eat it down if they can get at it.

The tree requires a soil fairly free from large rocks or bedrock rather than a loose soil. I have known them thrive among boulders, but die out, even at ten years of age, when sheet-rock was met with 8 feet below the surface. They do not require rich soil nor heavy rainfall. Once established they draw moisture from great depths to the surface, and, while immediately under them the shade may be too dense for grass, pasture luxuriates in their immediate vicinity. For a hardwood tree it is quickgrowing, attaining a height of 15 to 20 feet in four years, and usually coming into bearing about that time.—*Queensland Agricultural Journal.*

FRUIT FLY.

By G. BUCHANAN.

The following report on the Fruit Fly has been sent in by the Chief Inspector, Mr. G. Buchanan, who says:—

During the past six years the Fruit Fly has been rapidly making headway in the gardens in the vicinity of the city. The spread of the fly was particularly virulent in the neighbourhood of West Perth, where many old gardens exist. So great was the damage effected in this locality that very little marketable fruit could be secured, and growers found their fruit trees a source of worry and expense rather than of profit, and many of them were inclined to regard the effective treatment of this pest as an impossibility.

2. With this view in their minds a deputation of West Perth orchardists waited on the then Minister for Lands (Dr. Jameson), and, pointing out the damage effected by the fly, suggested the trees in their gardens should be grubbed out and compensation awarded them, it being argued that the destruction of trees in badly-affected districts would act as a check on the spread of this desperate pest.

3. Instead of this suggestion being adopted, it was decided to try the starving-out method of removing all fruit from the trees. With this end in view a close examination of all gardens in the district was made and in all cases where the fly was found the places were declared to be "infected," as provided in Section 7 of the "Insect Pests Act." The application of this clause of the Act gives power to order the removal of all fruit from the orchard—a course which cannot be adopted otherwise unless all the fruit is diseased On the places being thus placed in quarantine, the growers were ordered to remove all deciduous fruit from the trees within 14 days. Citrus fruit, not being at that time sufficiently ripe to attract the fly, were allowed to remain. After very little difficulty these orders were all given effect to, and the fruit being all removed, it was believed the great majority of Fruit Flies—which were then about in vast numbers—would be starved out. At any rate, the absence of fruit could be relied on to prevent the fly continuing its work of re-production.

4. Following on this action last season, it is most interesting and gratifying to be able to report that the depredations of the Fruit Fly in the West Perth gardens show a marked diminution this year. Inspector Lankester, who has just completed a close examination of this locality, to ascertain if there is any appearance of the Codlin Moth in the gardens, reports them not only quite free from that insect, but also in regard to the Fruit Fly, "that a small quantity compared to last year is affected. Pears and apples, which were absolutely unsaleable in February last, have not been

attacked this year, and peaches and nectarines in a number of gardens are free. Growers fully recognise the value of the severe measures taken by the department last season, and quite agree that it is the only way to check this pest." In the past growers have been inclined to look for some patent remedy which would at one blow rid them for all time of this scourge, and when they found this impossible of realisation many of them lost heart and were willing to passively resign the product of their trees to the fly. In such cases the power of the Act has been sufficient to spur on their flagging energy and force the continuation of the simple method of picking and burning infested fruit, with the result that the efficiency of this line of treatment being now proved of advantage to themselves as well as of benefit to their neighbours, the growers can, in a measure, be relied on to take the necessary action without waiting to be compelled to do so. Now that growers in the infested localities are thoroughly educated in the methods to be adopted and are assured of the satisfactory results accruing from such action, they are found to work much more in harmony with the officers of this department, and begin to realise the efforts of the inspectors are directed to secure the ultimate good of the growers themselves. Whereas a few years ago it was even difficult to force people to pick and destroy their diseased fruit, it is now quite the common thing to find on visiting a garden that the grower has already done all that the inspector could ask.

5. While the conditions of affairs in localities like West Perth, where growers have been thoroughly drilled in dealing with the pest, are so satisfactory, it is yet to be proved that growers in more remote districts where the fly has appeared are so keenly alive to their own interests.

The appearance of the Codlin Moth in Perth has caused the inspectors to be concentrated in the metropolis to thoroughly examine all gardens in the neighbourhood of the outbreak, but now this has been completed, the inspection of the outer districts to which the fly has reached will be commenced at once. As the country fruitgrowers depend more on their gardens to yield a profit than do their town brethren, it is generally found they are more keenly alive to the necessity of combating pests of the orchard; but as many of them have not had actual experience of the damage which this insect is capable of doing, they may be inclined to be less careful than they should be, and in such cases it will become necessary to use compulsion to keep them up to the mark. When it is found possible to keep the pest in check in a district where it has obtained such a hold, and where so many orchards adjoin, as in West Perth, there can be no excuse for allowing isolated orchards in clean districts to become badly infested.

A RABBIT DRIVE IN RIVERINA, N.S.W.

By Daisy M. Bates.

I started on a visit to Tupurupuru Station, situated on the Lachlan River, in July of the year '92.

My principal object in visiting the bush at that time of the year (the rainy season) was to take part in a rabbit drive, and I had often been told that this district was the best place to go to for such a purpose, the rabbits taking to that part of the country as "a duck takes to water."

I arrived in Hay, a small township on the Murrumbidgee, after a long railway journey of eighteen hours from Melbourne, and at two o'clock in the afternoon found myself on the box seat of one of Cobb & Co.'s coaches, determined to push right through to the station and take my rest all at once. I little knew what lay before me! I had chosen the very worst time of the year for my visit. A visit to the Riverina district at any time is anything but an unmixed blessing, but I should not advise anyone to try it in the rainy season as I did. The roads, mere bush tracks at the best of times, were simply rivers of mud. For a short distance outside the town, and where the shire council had metalled the roads, things were not so bad, but when we had passed them and reached the "bush road" the journey was anything but a joy.

We plodded along; now and again a trace breaking or a horse falling, to vary the monotony of the route. Within a radius of forty miles only one tree was to be seen, and beside this miserable specimen of its kind some one had built an hotel, and called it "The One Tree Hotel." Notwithstanding that the ground was soaked with the seasonal rains, the rabbits were there in myriads gambolling round the salt bush tufts that seemed to be the sole herbage on these plains, and they were manifestly so perfectly at home that they merely cocked their ears at us as we passed, and continued their gambols.

We "dined" at the "One Tree," after a journey of 25 miles which it took us nine hours to accomplish, and after an hour's rest we again started in pouring rain. I still continued to ride outside, as getting wet and bedraggled was infinitely preferable to sharing the inside with three odouriferous Chinese and an inebriate squatter. Eight miles farther on, the station buggy was to meet us, but when we reached the appointed place it was not there, and so we travelled further on to one of Cobb & Co.'s huts where we rested till daylight, when the welcome sound of buggy wheels reached our ears which proved to be our future host's, who was full of regrets for the delay and inconvenience to us, but having to cross the Lachlan three times, besides eight creeks, all of them bankers, his journey occupied many more hours than he had foreseen.

There is a peculiarity about the soil in the vicinity of the Lachlan River that anyone who has had the pleasure of travelling on it in the wet season will bear witness to. The earth seems to be "mixed with glue," and as you walk it adheres to the soles of your boots, and every step you take a fresh layer of earth being added, after you have journeyed only a few paces you find yourself walking on stilts which cannot be got rid of until you take off your shoes. and with a good sharp knife "pare" it off, feeling that you are trying to cut indiarubber.

However, be the difficulties what they may, it was "Hobson's choice" with us, for it was impossible to stay any longer in the old tumble-down and not over-clean hut; therefore, after the horses had had a good feed, what was really the most arduous part of the journey was undertaken.

Our host, like "Paddy the Pilot" knew every "stick and stone" in the river and creeks, but like that historical personage, he often struck them before he could say "that's one on 'em"!

Some of the smaller creeks, though in flood, were easily crossed, with others, we had to fix our boxes on the seat and sit on them, keeping clear of the floor of the buggy, through which the water swirled and swished within an inch of the seat, where we were "hanging on by our eyebrows." This in itself was bad enough, but the climax came when we reached the first point of crossing the Lachlan. At each of the three points a small dingey was moored, two posts were fixed at either side of the river, and a wire rope stretched across these. When we got to the bank we descended from the buggy, got into the dingey, and pulled ourselves with the aid of the wire rope to the opposite bank. The harness was carried over piecemeal, the horses swam over, and we fastened ropes to the shafts and bar of the buggy and pulled that through the water. And this performance had to be repeated three times, for the Lachlan, like most of the Australian rivers, describes the shape of the letter S many times over in the course of a mile. It was well on in the afternoon when we sighted the welcome iron roof of Tupurupuru. Long before we reached it the inmates had seen us, and were assembled in force to greet us, and a sorry sight we looked indeed. Through a mishap in crossing, I had lost my hat and could not, *dared* not, open my box to get another, so I arrived hatless, weary, wet, ragged, but too truly thankful to be anything but amiable, and indeed we were already viewing the ludicrous side of our adventures.

The homestead was a snug little place, taking into consideration the uninviting aspect of the flat, treeless plain around. Whatever could be got to grow in the shape of creepers was flourishing round the verandah. A small garden was deligently looked after by "the girls," and a few flowers of brilliant hue greeted our eyes as we reached the gate. I was glad to let my eyes rest on them after the long stretch of greyness in the landscape through which we had just passed.

After a very warm welcome, we were conducted to the dining-room, and sat down to a most appetising repast, and immediately afterwards I was bundled off most unceremoniously to bed, my host remarking that I should be fit for nothing until I had at least two days' sleep. I contented myself with 16 hours' repose, and awoke feeling as though I had but dreamed the awful experience of the two previous days.

When I had taken my first survey of the country round, I felt I had not "braved the elements" in vain, for the rabbits here were thick as leaves in Vallombrosa; even the dogs won't hunt them, for as soon as they have started one, fifty others jump up from every clump of bush, and the original rabbit they started is lost among the crowd; so the dogs content themselves with killing any rabbit that may happen to tread on their toes. Moreover, selectors who had taken up country on either side of my host's "run" neglected to take any measures whatever to stop the spread of the rabbit, and though my host had men engaged in the work of snaring, poisoning, and shooting the pests, his efforts were rendered almost nugatory by the supineness of these neighbours of his who took no means whatever to assist him in his work of extermination.

Three days after my arrival, word was sent forth that a big rabbit drive was to be held on the following day, and a courteous invitation was given to the neighbours to take part therein. At their last "muster" they had driven over a thousand rabbits into the pens, but this was to be a phenomenal expedition, and thousands were expected as the result.

All the squatters and selectors within a distance of 90 miles were bidden to the fray, and very early next morning we were all awakened by the by no means amicable noise of about two hundred dogs assembled to aid us in driving "bunny" to his doom. Cattle dogs, sheep dogs, kangaroo dogs, kelpies, thoroughbred, and mongrel (principally mongrel) were outside the house, barking, snapping, fighting, yelping, until the din became deafening, causing us to make all the haste possible to start for the scene of action. Our plan of campaign (and I don't see why it shouldn't be so designated—our foe was a formidable one) was this: Firstly, about three-fourths of an acre was hemmed round with wire netting, leaving an opening at one end of about twenty feet for "bunny" to enter. This was erected within two miles of the homestead. Then the men and women of us were to ride about eight or nine miles into the bush, riding quietly and not too far apart, also keeping the dogs well to heel (there is not a better trained dog anywhere than the bush dog, mongrel or otherwise though he may be). As soon as we had reached the distance decided upon, at a signal from my host, who assumed the lead *ex officio*, we were to turn our horses heads towards the enclosure, form ourselves into as near a semicircle as we could, and, though still riding slowly, each and every one of us was to begin to yell, shriek, scream, and make all the outcry of which our lungs were capable. These yells were to stir up and frighten the "bunnies," who commenced to run hither and thither, trying to escape from the Scylla of a series of blood-curdling yells at one side, only to precipitate themselves into the Charybdis of another and even more fiendish conjunction of sounds in the opposite direction. Such a unique collection of noises it has never been my lot to hear; it made you think of Dante's "Inferno," or Bedlam. It was impossible for "bunny" to get back with the string of dogs keeping him ahead, and the only direction in which he could travel headed straight for the enclosure. In a short space of time we were "travelling South" with the largest mob that ever passed at one time through New South Wales. And, oh, the varieties of colour, from coal black through all the "piebald" range of black, brown, grey, and white, their diminutiveness and the many-coloured hues quite dazzling our eyes as we looked at them. The dogs were kept well in hand, and helped to direct "bunny" straight for the "lockup"—they only killed him when he ran under their noses. Many of the dogs won't eat a rabbit.

We journeyed on very slowly, our mob increasing at every yard almost; far in the distance we could see the "white line" of the enclosure. Now and again "bunny" would make an effort to break back, but a series of louder yells forced him quickly to the right-about. There they were, a moving kaleidescopic flock, wondering, I suppose, what was coming to them and why they should not be left to the peace and quiet of their home instead of rushing hither and thither vainly trying to escape those awful sounds; and the sounds were terrible! As we warmed up to our work and the "don't care" feeling set in, and we had become less ashamed (the women of our party) of giving out hideous noises, it became a matter of competition with us as to who should "take the cake" in that contest. We screeched, we yelled, we laughed, we cackled, we crowed, we (those of us who had heard it) sent forth the aboriginal war cry, in fact all the noises that have ever been invented were all abroad that fine morning. Occasionally, in the intensity of the "struggle for supremacy," a horse would go knee-deep into a deserted warren, and his rider, too intent on his desire to excel in this novel vocal contest to heed his manner of riding, would find a momentary "second seat," much to his chagrin and the amusement and good humoured chaff of his comrades; and thus, in high spirits, and with an ever-increasing mob of rabbits, we continued our "drive."

As we neared the enclosure we began insensibly to narrow our semi-circle, so that when we should arrive there, "bunny" would be compelled to pass through the only opening left to him, the gate of the enclosure. This we accomplished, and we penned almost all of those we had driven; the few that did manage to slip round the corner being promptly despatched by the dogs who, after the gate of the enclosure had been closed, were encouraged to chase and kill all that had escaped from us.

Then the business began, with the men, of killing and counting the proceeds of the day's spoil; we women starting homeward, indulging in our first canter for that day, and arriving home with sore throats, hungry too, notwithstanding their soreness, but in high good humour at the success of the day's sport.

In the evening, when the men returned from the slaughter, they informed us that there were over 4,000 rabbits in the pen, and I think we might easily add another thousand for those the dogs killed on the way. It was not a bad day's work, and if it could have been followed up now and then, adopting all other available measures for the extermination of the pest, they might have been able to cope successfully with the rabbit nuisance. As it is, "bunny" "rules the roost," and has it pretty well all his own way in the Riverina district. Saltbush soil (and there is some splendid saltbush inland from the Gascoyne in W.A.!) seems to be his "happy hunting ground," and he waxes fat and multiplies incredibly, no matter how the seasons go, or what the amount of herbage on the plains. He does not eat the saltbush, but in emergency he nibbles at it, and exists on the juice he can extract from its small leaves, and no sheep will touch a bush that bears the marks of "bunny's" depredations.

That evening we unanimously awarded the prize—a stewed rabbit—to Dick Forrest, whose yell sounded like a crowd of cannibals on the war path, and whose noble expanse of mouth favoured the issue of a volume of sound that left us all far behind in the contest. Dick modestly declined the prize, which, however, he had by proxy, the boys taking it out to his kangaroo dog "Weller," who appreciated the savoury morsel.

Early next morning a deep trench was dug, and the rabbits were shovelled into it; and when we rode over the same ground in the afternoon it did not seem to me that we had made any perceptible difference in the number of the rabbits; they appeared just as numerous as ever.

Thus ended my first rabbit drive.

BEE REPORTS.

By Jno. Sutton.

I beg to report having inspected as under:—

Mr. Robinson Cook's apiary at Cannington, who has seven colonies of hybrid and black bees; indications of the ravages of the moth may be seen in most of them, but they are at present fairly clean. During swarming hybrids and blacks get mixed, and this accounts for the moth having been cleaned up.

Several others in the immediate neighbourhood have bees in frame and box hives, but I had not time to cover all the ground on this visit. Also I learned that a large number are kept in Victoria Park and South Perth who are not yet registered.

Mr. Dalton, Claremont, has nine colonies of hybrids that are in good condition, but for want of proper appliances and attention are a good deal crowded; an abundance of honey stored. Here I found the small black ant is a great trouble, necessitating the hives being kept standing in water to keep them out of hives, and on examining, when standing a super down, it was immediately covered with the pests, and once a bee had the misfortune to get down on the sand it was at once crippled with the large number of ants attacking it. Here, as elsewhere, I had to give instructions, and generally fix up matters, which takes a considerable time, and the exceeding hot weather made it on this occasion a very slow process.

Captain Oats, of Penrith, Mounts Bay road, Perth, has four colonies of Italians. These were also in good condition. But supers, some full of honey, were placed on the hives in such a manner that the task of putting them in order was not one of the pleasantest jobs. However, I fixed them up as best I could, and gave full instructions for future operations.

Mr. Robert Taylor, of Coogee—postal address "Woodlands," Beaconsfield—has now 28 colonies of Italians, having built up from nine colonies during this season. He has extracted over half a ton of honey, some of which, from the bloom of the almond trees in the neighbourhood, was very fine sample of real good honey. Close to Mr. Taylor are a number of small holdings, market gardens mostly, with fruit trees coming on, and his neighbours have expressed their appreciation of Mr. Taylor having introduced the bees into the district, as their crops of melons, pumpkins, and similar vegetables have been larger during this season than they ever had on previous years, and this they attribute to the bees on the flowers.

I had arranged with Mr. Taylor to inspect a number of other apiaries near and on the Jandakot area, but, on account of the weather, had to abandon the trip for the present.

Mr. James Arnott, Shearer Street, Highgate, has two colonies of Italians, and Mrs. Cooke, of Lincoln street, has two colonies, all of which are in good condition, but over-crowded with honey and stores.

Mr. O. G. Lewis, of Smith Street, had 13 colonies, mostly black bees, and the moth is in evidence in most of them. Some have this season had Italian queens introduced, and it is an interesting sight to examine the work done in clearing out not only the moth but all evidence of their presence. Most of Mr. Lewis's trouble is leaving the honey stored too long, which causes the bees to become restless and clear out by excessive swarming. Here again the ants are a trouble, and the hives are standing in water, consequently, when a swarm issues, the queen, if unable to take wing, is at once seized by a large number of the small pests which abound and killed.

With the one exception (Mr. R. Taylor) none of those visited had an extractor, hence although they all have plenty of honey it has to be cut out and strained. This method, in most cases, gives a poor honey, as its aroma is destroyed, and instead of their having a good marketable class of honey most of it is not even second class. Unfortunately, extractors and appliances generally are not to be had in the State at the present time, and the crude methods adopted by most people to get their produce into marketable shape is not improving the sale for West Australian honey.

I do not think I should close this report without expressing my firm conviction that with proper methods and modern appliances this State can hold its own, and honey in abundance, equal to the best imported from the Eastern States, could be produced; and the strides that have been made this season is positive proof that at an early date we will be in a position to export ourselves, and to this end it should have the attention of all engaged in this important industry to assist in every way possible to have only the best sent to market.

Another matter, perhaps, it would be worth consideration, namely, that your department take steps to procure samples of honeys from the United States, Jamaica, Cuba, Trinidad (West Indies), New Zealand, and the Eastern States, such samples to be kept in your Museum, and be accessible to bee-keepers in this State. A step in this direction deserves consideration, as it would assist those interested in acquiring knowledge as to what real genuine honey should be, and further enable producers to discriminate between our own product and that which finds at all times a ready market in England.

SUBSIDIES TO SOCIETIES.

Societies are advised that the Department of Agriculture is now prepared to deal with all claims for subsidies in accordance with the provisions of the following circular letter:—

Department of Agriculture,
Western Australia.

SIR,—With reference to the distribution of Government subsidies to agricultural and kindred societies, I am directed by the Honourable the Minister to inform you that these grants will this year be distributed by this department on the following conditions:—

2. Subsidies will be paid on a basis of 5s. in the £ on all cash prizes paid away at shows held during the current year (financial), viz., from 1st July, 1902, to 30th June, 1903.

3. Subsidies will only be paid to purely Agricultural, Horticultural, and Viticultural Societies. Applications from Dog and Poultry Societies will be received and dealt with on their merits.

4. Grants will only be paid on cash prizes (not trophies) and only for purely agricultural items. Prizes for needlework, log-chopping, jumping, etc., must not be included.

5. After the current year subsidies will be paid only on cash prizes, less the amount received as Government subsidy in the preceding year, and no subsidy will be paid to any society offering less than £50 in cash prizes, exclusive of the subsidy for the preceding year, with the exception of societies holding pruning contests, which will be subsidised to the extent of 5s. in the £ on all cash prizes, less the preceding year's subsidy.

6. Application for grants must be made on forms supplied, which must be signed in the presence of a Justice of the Peace.

7. Applications must be accompanied by the prize schedule, balance-sheet, and a receipt form as forwarded herewith.

8. Applications must be made within one month from date of show, and no application for this year will be dealt with after the 1st June, 1903.

9. Further supplies of application and receipt forms can be obtained if required.—I have, etc., W. B. HOOPER, Chief Clerk.

As the system adopted this year marks the initiation of a new scheme, par. 4 will not be rigidly adhered to. Trophies will not be allowed to count as cash prizes, but all items for which cash prizes have been paid may be included in the claim.

The application form should state where and to whom the amount due is to be paid.

The receipt forms supplied are merely for the convenience of the societies. If it is more convenient to procure separate receipts from individual prize-winners that course may be adopted.

Early application is recommended, and on no account will any application be received after the 1st June in connection with shows held prior to that date.

HOW TO UTILISE SOUR MILK.

The higglers and chicken fatteners in the Heathfield district of Sussex, from which station many tons of fat chickens are sent away every week to London, and where they manufacture "Surrey" fowls from chickens hatched in Ireland, know full well the value of sour milk for mixing the food on which the birds are fattened, but in many places, where the only apparent alternative is giving it to the pigs, it is often thrown away.

Not only is new milk that has gone wrong during hot weather or during transit by rail, and has been returned to the farmer by the consignee, utilised in this way, but skimmed milk from the farms where butter-making is practised and the separated product from the solitary creamery the district boasts, is assiduously collected and stored for the purpose of conversion into fat chickens for the London, Eastbourne, and Brighton markets.

We know of one farmer's wife who makes butter and keeps pigs, who finds it more profitable to sell her skimmed milk to the chicken fatter than to give it to the pigs, and presumably the chicken fatter finds it pay to buy the sour material, which is collected only once a week and is sour indeed when it leaves the farm.

We are told that in the chicken fattening districts of Gambais, whence the Paris markets are so largely supplied, sour milk is almost exclusively used for birds intended for table; that when milk is plentiful in summer, any not required for present use, or that has become soured, is stored away in casks to supply the winter demand, and that milk, five or six months old, is often to be found on these model fattening farms.

A well-known authority on utility poultry matters, who writes under the *nom de plume* of "Heathfield," has recently been pointing out to the farmer what the chicken fatters of his district have learned, from practical experience the fact that, where fowls are kept, soured milk may always be used profitably, especially where table birds are required:—

"It acts as an excellent regulator of the fowl's system, keeping the complicated digestive organs of the bird in good working order; liver disease is seldom seen in poultry yards where sour milk is in general use, and it is a well-known fact that Surrey fowls, when being prepared for market, have their food mixed with milk that is many weeks old; in fact, you can recognise the fatter's premises in the dark, if driving along the country roads, by the odour proceeding from the milk tanks. Birds that will later make their appearance in Leadenhall, in all the glory of flesh that an old hand at fattening knows how to obtain, will feed naturally—that is without being put on the machine in the coops—when given food mixed to the consistency of thick cream with soured milk."

A sweet milk-fed bird is said to sicken of food necessitating its being crammed by artificial means, much sooner than when its food is mixed with sour milk. The same authority points out that it is the acid in the milk which is considered valuable by the fatters, as demonstrated by the fact that "when the supply runs short, rather than give some of the birds milk—with food and some water mixed—the full quantity of liquid required is made up by adding water to the already soured milk some hours before it is wanted for use, at a temperature calculated to assist the development of the acid-making bacteria."

Owing to the degree of acidity acquired by old milk, it should always be stored in barrels or wooden receptacles, as the acid will act upon metal, and eat holes in such vessels as disused travelling churns.

There are very few farms where some fowls are not kept, for even where the farmer despises them as a source of income, some are kept to supply domestic requirements, or, in more cases, to provide the mistress with dress money, and to these it may be useful and interesting to know that, no matter to what degree of sourness milk has attained, it may always be used to advantage in the feeding of chickens. So says a writer in a contemporary.

THE ART OF BREEDING.

THE SAME LAWS CONTOL BOTH ANIMAL AND VEGETABLE LIFE.

American Sheep Breeder:—The same natural laws control all varieties of life. The very same rule which applies to the culture of plants, equally apply to that of animals. Thus the shepherd, or live stock breeder of all kinds, may gather useful information as to the science, and consequently the practice, of his art and business by the study of the laws of all organic growth, animal or vegetable. We have previously discussed the actual scientific conditions of the reproductive functions, as far as the nature and structure of animals are concerned; suggested the future consideration of the next step—that of supply of material for the growth of the germ already vitalised by the coupling of the parent. We have seen how the seed is sown, and in continuing the matter we must next think of the growth of the product of the seed. It will simplify the study to continue the example previously suggested and follow the matter through its gradual stages in the same line by reciting the well-known conditions by which vegetable growth is sustained and stimulated. The farmer fertilises the soil by a supply of the most suitable food to it, in which the seed is sown. The seed, under the influence of the moisture and warmth to which it is subjected, starts into active life; and the vital germ breaks through its envelope, and the formation of the plant begins its first stage of existence, in which it is sustained by the substance of the seed itself, in which the germ is contained. In a similar way, the seed of the animal is sustained by the vitality of the mother, absorbing from her body the materials of which the young animal must be formed and must subsist during that period through which its own special separate life is being prepared for. The body of the mother is this soil, as we may say, and the growth of the fœtus or future animal is derived from this source. This idea at once is the basis for due consideration of the breeder of any animal who wishes only to preserve the life and existence of the produce of his herd or flock, but becomes much more so with him who is desirous of improving his flock or herd. And this improvement, as with all others, whether animal or vegetable, is done by the due supply of food for improved growth and vigour of the parents. In the care of the flock this can only be done by the proper supply to the ewes of such food as will enable them to duly nourish the young lamb within her. Here lies the close analogy between the breeder and the farmer. The one must feed his expected crop in precisely the same way and on the same principles as the other. The growth of the progeny is made through the supply of foods of the right kind to the parent on whose substance the young animal is existing. For these reasons we may easily see that the successful rearing of a flock depends—we may truly say—wholly on the accurate knowledge of the science of the art of feeding the sheep, both the rams and ewes especially, during the special season in which each is exercising its special function, and when the lambs are born feeding them on the same principles.

REGULATIONS FOR THE SALE OF FERTILISERS.

Department of Lands and Surveys.
Perth, 24th February, 1898.

His Excellency the Governor in Council has been pleased to make the following Regulations by virtue of the provisions of Section four of "The Fertilisers and Feeding Stuffs Act, 1895":—

Regulations under "The Fertilisers and Feeding Stuffs Act, 1895."

1. The fee payable to the Agricultural Analyst by the buyer or seller of any article manufactured or found in the Colony of Western Aurtralia, or

imported from abroad, used for fertilising the soil, for analysis of same shall be as follows :—

	£	s.	d.
Full analysis	3	3	0
Not containing potash or nitrogen	2	2	0
Soluble or insoluble, or total phosphates (each)	0	15	0
Nitrogen or potash (each)	0	15	0
Soluble and insoluble phosphates	1	5	0
Soluble and insoluble phosphates and potash ...	1	15	0
Soluble and insoluble phosphates and nitrogen	1	15	0

2. The fee payable to the Agricultural Analyst by the buyer or seller of any article used as food for live stock, which has been artificially prepared or manufactured in the Colony of Western Australia, or imported from abroad, for an analysis of same shall be as follows :—

	£	s.	d.
Full analysis	2	2	0
Albuminoids	0	15	0
Oil and fibre (each)	0	10	6
Ash and water (each)	0	5	6

3. Every seller and every buyer of any article used for fertilising the soil shall be entitled, on payment to the analyst of the fee or fees in accordance with Regulation one, to have the article analysed by the analyst and to receive from him, within fourteen days, a certificate of the result of his analysis.

The certificate of the analyst shall be in the following form :—

I, the undersigned, A.B., analyst, do hereby certify that on the day of , 18 , I received a sample, labled [here state name of fertiliser, and of the manufacturer or importer, his place of business, trade mark, or figure (if any)], for analysis, the result of which is as follows :—

Percentage of nitrogen.
Percentage of soluble phosphates.
Percentage of insoluble phosphates.
Percentage of potash.

4. Every seller and every buyer of any article used as food for live stock which has been artificially prepared or manufactured in the Colony of Western Australia or imported from abroad shall be entitled, on payment to the analyst of the fee or fees in accordance with Regulation two, to have the article analysed by the analyst, and to receive from him, within fourteen days, a certificate of the result of his analysis.

5. The buyer, on receiving delivery of any fertiliser or feeding stuff and before otherwise breaking the bulk thereof, shall, in the presence of the analyst, a Justice of the Peace, or a police constable, take three samples of the article and cause them to be marked with the date and place of sampling, the names of the persons present, the figures or trade mark on each package, sealed and fastened up, and shall deliver or send by post (prepaid) one sample with the invoice or a copy thereof to the analyst, and shall deliver or send by post, as aforesaid, another sample to the seller, and retain the third sample for future comparison.

6. On the request of the buyer or seller of any fertiliser or feeding stuff, and on payment of the fee prescribed by Regulations Nos. one and two, the analyst, or some person appointed by him in that behalf, before or at the delivery of the article, shall take the samples on behalf of the buyer.

Regulations gazetted 5th June, 1896, are hereby cancelled.

GEO. THROSSELL,
Commissioner of Crown Lands.

GARDEN NOTES FOR MARCH.

By Percy G. Wicken.

By the time these notes appear in print the worst of the hot weather should be over, and, although there may be no immediate prospect of rain, advantage should be taken of every opportunity to get the garden cleaned up, and get everything in order for sowing at an early date. All rubbish should be buried; it is better if it can all be gathered together and allowed to rot before being dug into the ground; if stacked in a heap and well moistened it will soon rot, and is then ready for use. All ground not in use should be turned over as soon as possible, so as to allow the sun to have access to as much of the soil as possible, and the deeper the digging can be done the better. If subsoiling to a depth of two feet can be carried out it will prove an advantage. The subsoil need not be brought to the surface, but just broken up under the part dug, this will enable the ground to hold a much greater supply of moisture and also enable the roots to penetrate deeper into the soil. Plants at this time of the year wilt up during the hot portoin of the day; this wilting is caused by the water evaporating from the leaves faster than the plant can pump it up from the soil. Soon after sundown the plant resumes its normal condition, as the water evaporated is replaced; deep working of the soil will to a great extent prevent this, as the roots penetrating deeper into the soil enable them to supply a much greater quantity of moisture to the plant. The area of land under kitchen and market gardens is yearly increasing, although at nothing like as fast a rate as one would like to see. The returns for the year 1901, the latest available, give the area as kitchen gardens 840 acres, and market gardens 1794 acres; this does not include the area under potatoes and other root crops; these crops account for another 2,000 acres, and an additional 8,621 acres are under fruit trees and vines; when the returns for the past year are available I expect we shall see a still further increased area under these crops. The total area under all crops in the State is given as 201,337 acres, so it will be seen that only a small proportion of the total area under cultivation is devoted to garden and orchard purposes; there is plenty of room for a largely increased area being put under garden crops. The principal work of the month is to keep the cultivators going among the growing crops, and to pay attention to the saving of seed for future use. In selecting plants or melons, pumpkins, etc., for seed purposes care should be taken to see that the plants are true to name, and they should be allowed to fully ripen before taking the seed. The seed should be thoroughly dried before putting away, otherwise it is likely to heat and the germinating power is lost.

Asparagus.—A bed of sufficient size should be prepared in good time for planting early in the season. It should be trenched

2ft. deep, keeping the surface soil on the top. Dig in while trenching a liberal supply of well rotted farm yard manure and mix well with the soil. The soil should be left in a rough condition as it will then have a good chance of mellowing by planting time.

Beans (French).—Except in a few of the warmer localities, this crop will be nearly over. In hot parts, where there is no danger of frost, a few rows may be sown.

Beans (Broad).—This vegetable likes a heavy clay loam soil, although it will grow and bear in most soils. It should not be sown before the end of the month, and the ground requires to be well broken up, and if poor apply plenty of stable manure. Do not apply nitrogenous manures. Bonedust, superphosphate, and potash are the manures which should be used. Sow in rows 3ft. apart and about 5 inches in the rows.

Beet (Red).—A few rows may be sown. Thin out the plants that are coming up from previous sowings.

Borecole or Kale.—This is a plant which some like as a vegetable, and others do not think it worth growing. Seed may be sown the same as cabbage, and plants put out. It yields a large amount of green stuff, which can be used for the table or for stock.

Cabbage, Cauliflower, and Brussels-sprouts.—Plenty of plants should be available from the seed beds, and they should be planted out as soon as the ground is moist enough. Plant in rows 3ft. apart and 2ft. in the rows.

Carrots.—Plant out a supply for the winter. The drills should be 18in. apart. The seed takes some time to come up, and the weeds want looking after.

Lettuce.—Sow a little seed to have a few plants handy for planting out when required; for garden use it is better to plant out only a few plants at a time and have them fresh than to plant a number at one time and perhaps have them wasted.

Melons and Pumpkins.—Store away for future use all those that are sound, they will be useful later on; any dry shed will do to store them in.

Sweet Potatoes should now be ready to dig. They can be stored, and if kept in dry sand will keep good throughout the winter.

Tomatoes are getting scarce; destroy by burning or boiling all diseased fruits, to prevent the spread of disease.

Peas.—In the cooler districts, a few rows of peas may be sown. Work the ground well, and apply plenty of potash and manures.

Turnips.—Prepare as much land as you require for this crop, and as soon as the rain comes sow full crops. There are a great number of varieties to choose from in both white, yellow, and Swede varieties.

Farm.—The crops being now all under cover, and the bulk of the wheat crop either sent to market or stored until the grower cares to sell, leaves the settler with more time on his hands. Before putting his harvesting machinery away, however, he should take care to thoroughly clean all parts of the machines and to give them a good coating of oil or grease. Exposure to the weather and putting away in a dirty, rusty condition do more to deteriorate a machine than the actual work done.

The present price of wheat and chaff at the commencement of the season should be of great encouragement to settlers to put in a larger area for the coming season, and to do this ploughing should be pushed on with as fast as possible, so that when the rain comes the whole attention may be given to cultivating and seeding. In nearly all cases, especially in our Eastern districts, the earlier sown crops have given the best results. The disc ploughs are found by many to work well where the ground is too hard for the ordinary plough. Those who have stacks of hay and do not intend chaffing before the winter should see that they are thatched or covered so that the wet cannot penetrate, otherwise they are likely to be losers. Seed drills should be looked to and got ready for use as soon as rain falls. Those desirous of growing some winter feed for their stock can plant crops of rape, mustard, kale, mangels, or turnips as soon as sufficient moisture is in the soil to germinate the seed.

RAINFALL FOR THE YEAR 1902.

The accompanying table shows the rainfall for last year, at every station in the State from which returns have been received.

At a few the records are still incomplete, and totals for 10 or 11 months are given, as stated in the footnote.

Compared with the averages for previous years, the fall was very light in the principal agricultural areas, *i.e.*, from Geraldton to Bunbury, and for about a hundred miles inland. In the Perth district we received only 26 inches, as against an average of 31, and in the next square degree East, which includes Newcastle, Northam, and York, rather less than a mean of 15 inches were recorded, the average for previous years being 21. Along the South coast, between the Leeuwin and Esperance, the fall was about normal. Throughout the Goldfields and in the South-East it was considerably in excess of the average. The Kalgoorlie district, for example, had 13½ inches, as against 7 for previous years. From Geraldton and the Murchison Northwards it was mostly rather light on the coast, and fairly heavy inland. In the tropics it varied considerably, but was on the whole about normal.

The fall was distributed amongst the individual months as follows:—

January.—Very heavy throughout the State, except in central West coastal districts, where only a few showers fell.

February.—Very light in West and South-West districts. Heavy in interior and tropics.

March.—Very light throughout.

April.—Very light throughout.

May.—Heavy throughout South-West districts; slightly above normal in West coastal districts. Patchy on Fields, but, on the whole, in excess of average for previous years. Light in the tropics.

June.—Below average in West and South-West districts. Elsewhere about normal.

July.—Very heavy in South-West districts, especially during first half of month. Elsewhere normal.

August.—Very dry except on the Goldfields and in the extreme South.

September.—Universally heavy, generally South of the tropics.

October.—Generally about normal, but light in the neighbourhood of Perth. Heavy thunderstorm on Goldfields on the 19th.

November.—Light throughout the State, except at a few places in tropics and on the Goldfields, where heavy scattered thunderstorms occurred.

December.—Very light, except in the extreme North and extreme South-East.

W. E. COOKE,
Government Astronomer.

The Observatory,
Perth, 3rd February, 1903.

RAINFALL for the Year 1902.

(Completed as far as possible.)

STATIONS.	No. of points. 100 = 1in.	No. of wet days.
EAST KIMBERLEY:		
Wyndham	3,011	54
6-Mile*	3,552	38
The Stud Station*	2,676	48
Carlton*	2,635	50
Rosewood Downs	—	—
Argyle Downs	—	—
Lisadell†	1,829	32
Turkey Creek	2,430	55
Plympton St. Mary	—	—
Koojubrin	—	—
Hall's Creek	1,737	48
Flora Valley†	1,121	25
Ruby Plains†	1,615	34
Denison Downs*	1,698	49
WEST KIMBERLEY:		
Obagama*	2,994	50
Beagle Bay	—	—
Derby	1,593	26
Yeeda*	1,810	29
Liveringa*	2,032	25
Mt. Anderson*	1,957	28
Leopold Downs*	1,970	31
Fitzroy Crossing	1,272	42
Fitzroy (C. Blythe)	—	—
Quanbun*	1,752	20
Nookanbah	—	—
Broome	2,236	40
Roebuck Downs	—	—
Thangoo†	2,264	—
La Grange Bay	2,719	46
NORTH-WEST:		
Wallal	2,109	24
Condon	2,074	25
DeGrey River	1,805	26
Port Hedland	1,462	28
Boodarie	1,235	17
Yule River	—	—
Warralong	1,310	22
Muccan	934	25
Ettrick	1,209	25
Mulgie	1,343	19
Eel Creek†	1,029	20
Pilbarra	1,685	13
Coongon	1,154	12
Warrawagine	1,476	16
Bamboo Creek	1,341	25
Marble Bar	1,240	26
NORTH-WEST—*continued.*		
Warrawoona	1,406	30
Corunna Downs	1,148	21
Nullagine	1,674	28
Yandicoogina	—	—
Kerdiadary	1,513	11
Roy Hill	777	24
Mosquito Creek	—	—
Mulga Downs	1,326	22
Woodstock	—	—
Mt. Florence	1,640	28
Tambrey	1,783	32
Millstream	1,446	19
Yandyarra*	1,073	17
Mallina	1,158	20
Whim Creek	1,761	22
Cooyapooya*	1,748	16
Woodbrooke	1,593	17
Croydon	1,631	—
Balla Balla	1,506	23
Roebourne	1,101	19
Cossack	1,306	18
Fortescue	676	21
Mardie	512	12
Mt. Stewart	1,627	16
Yarraloola	654	16
Chinginarra	565	10
Onslow	441	20
Peedamullah	904	23
Red Hill*	1,164	12
Mt. Mortimer	1,186	25
Wogoola*	876	—
Nanutarra	641	19
Yanrey	—	—
Point Cloates†	818	31
GASCOYNE—		
Winning Pool	1,242	24
Towara†	625	25
Ullawarra†	702	17
Maroona*	562	16
Gifford Creek	1,210	19
Bangemall	1,396	25
Mt. Augustus	1,432	16
Minnie Creek	718	24
Yanyeareddy	719	21
Williambury	301	16
Wandagee†	507	12
Bernier Island	671	35
Boolathana	591	16

*** Eleven months only. † Ten months only. — Signifies "returns incomplete."**

RAINFALL FOR THE YEAR—*continued.*

STATIONS.	No. of points. 100 = 1in.	No. of wet days.	STATIONS.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*continued.*			GASCOYNE—*continued.*		
Carnarvon	910	27	Murrum	618	15
Cooralya	—	—	Burnerbinmah	—	—
Doorawarrah*	872	19	Yalgoo	612	29
Mungarra	1,241	25	Gabyon	754	25
Clifton Downs	1,123	23	Wurarga	—	—
Dairy Creek	823	30	Gullewa	583	29
Upper Clifton Downs	1,347	24			
Errivilla*	1,132	31	SOUTH-WEST DIVISION		
Dirk Hartog Island	785	54	(NORTHERN PART):		
Sharks Bay	580	24	Murchison House	1,243	56
Kararang†	791	42	Mt. View	864	42
Meedo	921	29	Mumly	—	—
Tamala	894	41	Yuin	—	—
Wooramel	941	26	Northampton	1,556	47
Hamelin Pool	691	31	Mt. Erin	1,221	51
Byro	1,130	27	Oakabella	—	—
Yarra Yarra	1,108	—	Narra Tarra	—	—
Berringarra	1,310	21	Tibradden	—	—
Mt. Gould†	1,103	21	Sand Springs	1,301	53
Moorarie	—	—	Mullewa	816	47
Wandary	—	—	Kockatea	666	39
Peak Hill	1,953	40	Bootenal*	1,133	33
Horseshoe	1,798	38	Geraldton	1,434	71
Mt. Frazer	—	—	Greenough	1,746	42
Abbotts	1,286	27	Dongara	1,288	37
Meekatharra	—	—	Dongara (Pearse)	1,327	50
Belele	—	—	Strawberry*	988	37
Mileura	1,493	26	Minginew	935	64
Milly Milly	1,015	12	Mingal	—	—
Manfred	964	25	Rothesay	—	—
New Forest	—	—	Field's Find†	685	21
Woogorong†	971	24	Carnamah	1,091	57
Boolardy†	791	8	Watheroo	926	48
Billabalong*	478	16	Dandarragan	1,607	56
Wooleane	841	23	Moora	1,016	49
Murgoo	708	21	Yatheroo†	1,723	62
Meka	869	25	Walebing	1,144	68
Mt. Wittenoom	675	26	New Norcia	1,487	64
Nannine	1,310	35			
Star of the East	1,231	30	SOUTH-WESTERN		
Annean	1,164	26	DIVISION, CENTRAL		
Tuckanarra	990	32	(COASTAL):		
Coodardy†	725	17	Gingin	2,624	66
Cue	900	32	Belvoir	2,435	71
Day Dawn	732	18	Mundaring	2,746	82
Lake Austin	630	25	Guildford	2,399	83
Lennonville*	645	22	Kalbyamba	2,705	91
Mt. Magnet	573	19	Canning Waterworks	3,170	73
Warracoothara	811	14	Perth Gardens	2,652	89
Challa	718	17	Perth Observatory	2,706	93
Youeragabbie	598	11	Subiaco	2,650	87

* Eleven months only. † Ten months only. — Signifies "returns incomplete."

RAINFALL FOR THE YEAR—*continued.*

Stations.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL)—*contd.*		
Claremont	2,650	81
Claremont (Richardson)	—	—
Fremantle	2,456	90
Rottnest	2,212	91
Armadale*	2,479	76
Rockingham	2,812	78
Canning River† ...	3,190	75
Jarrahdale	3,455	73
Mandurah	2,586	84
Pinjarra	2,717	86
Yarloop	—	—
Harvey	2,964	103
SOUTH-WEST, CENTRAL PART (INLAND):		
Hatherley	1,018	50
Momberkine ...	960	46
Mouglin	—	—
Culham	—	—
Newcastle	1,263	63
Eumalga	1,412	66
Northam	973	51
Grass Valley	946	50
Meckering	892	47
Cunderdin†	795	39
Codg-Codgen... ...	—	—
Jarragin	—	—
Doongin	874	42
Cuttening	—	—
Whitehaven	886	32
Sunset Hills	1,130	58
Cobham	1,114	65
York	1,113	66
Beverley	1,193	56
Barrington	—	—
Stock Hill	—	—
Sunning Hill ...	1,239	51
Wandering	1,789	83
Pingelly*	1,108	54
Marradong	2,138	70
Bannister	1,984	83
Narrogin	1,509	70
Wickepin	1,207	58
Gillimaning	—	—
Bunking	—	—
Bullock Hills ...	—	—
SOUTH-WEST DIVISION (SOUTHERN PART):		
Bunbury	2,507	104
Collie	2,781	114
Salvation Army Settlement*	2,618	92
Glen Mervyn... ...	3,146	98
Dardanup	2,664	82
Donnybrook	2,890	101
Boyanup	2,615	98
Ferndale	—	—
Busselton	2,440	141
Margaret River ...	—	—
Lower Blackwood ...	3,980	104
Karridale	4,527	179
Augusta	—	—
Cape Leeuwin ...	3,218	193
Biddellia	4,522	136
The Warren	5,211	127
Lake Muir	2,689	139
Mordalup	2,244	142
Deeside	2,739	132
Riverside	2,826	125
Balbarup	3,012	142
Wilgarup	2,991	136
Mandalup	3,054	104
Bridgetown	3,062	134
Greenbushes	2,911	99
Greenfields	—	—
Glenorchy	1,699	67
Williams	1,700	77
Arthur	1,634	88
Darkan	1,681	—
Wagin	1,471	75
Glencove	1,533	83
Dyliabing	1,358	79
Katanning	1,429	81
Kojonup	2,035	91
Broomehill	1,600	—
Sunnyside	1,545	89
Woodyarrup	1,466	92
Cranbrook	1,688	79
Blackwattle	1,959	73
Mt. Barker	2,858	126
Kendenup	2,571	114
St. Werburgh's ...	2,719	128
Forest Hill	3,198	161
Denmark	4,138	104
Grasmere	—	—
Albany	4,121	149

* Eleven months only. † Ten months only. — Signifies "returns incomplete."

RAINFALL FOR THE YEAR—*continued.*

STATIONS.	No. of points. 100 = 1in.	No. of wet days.	STATIONS.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST DIVISION (SOUTHERN PART)—*continued.*			EASTERN DIVISION—*continued.*		
			Widgemooltha	1,572	54
Point King	4,043	121	50-Mile Tank	1,190	43
Breaksea	2,740	158	Waterdale	—	—
Cape Riche	2,560	85	Norseman	1,382	60
Pallinup	1,358	90	Bulla Bulling	1,711	45
Bremer Bay	2,179	112	Woolgangie *	1,392	—
Jarramongup *	1,385	85	Boorabbin	1,328	53
			Karalee	1,285	45
EASTERN DIVISION:			Yellowdine	962	37
Lake Way	1,366	41	Southern Cross	1,021	52
Mt. Sir Samuel	1,155	38	Mt. Jackson *	742	30
Lawlers	1,222	47	Bodallin	960	31
Leinster G.M.	1,339	29	Burracoppin	806	—
Lake Darlôt †	1,216	27	Kellerberrin	722	44
Sturt Meadows	1,022	37	Mangowine	1,034	42
Mt. Leonora	934	47	Wattoning	835	21
Mt. Malcolm	916	27			
Mt. Morgan	1,025	38			
Burtville	1,062	36	EUCLA DIVISION:		
Laverton	1,228	43	Ravensthorpe	1,707	97
Murrin Murrin	1,009	46	Coconarup	1,562	102
The Granites	1,079	33	Hopetoun	1,886	115
Tampa	1,070	24	Fanny's Cove	2,806	77
Kookynie	1,046	—	Park Farm	2,574	105
Niagara	1,240	—	Esperance	2,448	120
Yerilla	1,188	41	Gibson's Soak	2,560	87
Edjudina	1,270	47	30-Mile Condenser	2,316	—
Menzies	1,126	34	Swan Lagoon	1,911	117
Mulline	1,514	28	Grass Patch	1,988	109
Waverley	1,208	36	Myrup	2,760	103
Goongarrie	1,378	36	Lynburn	2,572	91
Mulwarrie	1,329	45	Boyatup	2,541	90
Kurawa	1,508	40	Point Malcolm *	2,214	91
Kurnalpi	1,274	43	Israelite Bay	1,943	71
Bulong	1,231	44	Balbinia	1,904	80
Kanowna	1,391	44	Frazer Range	1,609	56
Kalgoorlie	1,201	46	Balladonia	1,585	69
Coolgardie	1,470	52	Southern Hills	1,721	56
Burbanks P.O.	1,332	48	Eyre	1,730	90
Burbanks Birthday Gift	1,301	43	Madura	1,529	70
			Mundrabillia *	993	68
Woolubar	1,205	39	Eucla	1,293	75

* Eleven months only. † Ten months only. — Signifies "returns incomplete."

The Observatory, Perth,
3rd February, 1903.

W. E. COOKE,
Government Astronomer.

THE CLIMATE OF WESTERN AUSTRALIA DURING JANUARY, 1903.

The most interesting meteorological feature of the month was the passage of a tropical disturbance down the North-West coast and thence across the interior, keeping well to the Eastward of the fields. It was first indicated on the morning of the 9th by heavy steady rain at Wyndham, in the extreme North. Next morning a storm warning was sent to North-West ports, which was fully justified by subsequent events. The disturbance, apparently, kept well out to sea, gradually travelling down the coast and bringing stormy weather as far as Broome, until the 16th, when it passed inland, but by this time had greatly diminished in intensity. It then travelled in a South-East direction and brought a few heavy thunderstorms to the goldfields, one at Menzies on the afternoon of the 19th being very violent. Its track lay well to the East of the fields, however, and so these districts received only the edge of the storm, with a very welcome cool change. Next day it had reached South Australia, where remarkably heavy dust storms were experienced.

These tropical disturbances are of the greatest importance in the meteorology of this State during the summer months. This has only been recognised during the last few years, and even now we know far too little about them. Unfortunately, the country is so sparsely populated that our observing stations are very widely separated, and we have only one fully-equipped station (Nullagine) between the North-West coast and the Upper Murchison. We are, however, gradually extending our knowledge, and have on several occasions, as at present, been able to give North-West ports ample warning of the approaching storm, and predict rainfall on the Coolgardie Goldfields for about a week in advance. The track of the best-developed storms seem to be from the extreme North down the coast, but keeping out to sea, until reaching latitude 18° to 20°. Here they recurve and pass inland, and thence cross the continent in a South-South-East or South-East direction. If there is a fair opening for them on our South-East coast they again take to the ocean there, spreading backwards for a time towards the Leeuwin and then onwards towards Tasmania, just like a winter "low," giving coastal rains and rough seas. If, on the contrary, they are blocked by high pressure along our Southern coast, they keep well away to the Eastward of the goldfields, and so on into South Australia. This was the case with the present disturbance. During the whole of their existence, from their first appearance in the extreme North to their exit in the South-East or East, they dominate the weather throughout the State. At first, whilst they are producing heavy rains in the North, a well-developed anti-cyclone (high barometric pressure) generally forms in the extreme South, and winds set in from the Eastward throughout the State, blowing fresh, with temperature gradually rising. Weather remains fine all South of the tropics as the storm works down the coast, but gradually clouds extend down the interior throughout the fields, although the West coast remains clear. The storm is usually most destructive, as it strikes the coast after recurving, but afterwards as it travels overland its area increases, but intensity diminishes, bringing a cool change and more or less rain to the parched goldfields.

This, briefly, appears from our present knowledge to be the history of these tropical disturbances; but, in addition, quite a number of somewhat similar but smaller ones pass across. These, however, generally work down the West coast and pass inland between Perth and Sharks Bay. They do not, as a rule, bring either stormy winds or much rain, but are sometimes accompanied by a few thunderstorms and almost invariably preceded by great heat and followed by a cool change.

A period of intense heat throughout the interior started on the 23rd, reaching a maximum on the 27th, when Kalgoorlie recorded 114·4 in the shade. On the morning of the 29th, however, one of the milder kinds of tropical disturbances appeared near the North-West Cape and travelled slowly South or South-South-East, bringing a cool change and breaking up the heat spell from which the goldfield inhabitants had been suffering.

The mean temperature for the month was about normal throughout, except in Eastern districts, where, principally on account of the intense heat during the latter part of the month, it was considerably in excess of the average for previous years.

The value of the coastal towns as a relief to the great heat experienced inland is, as usual, well exemplified in the accompanying report. By way of contrast, the mean of the daily maximum and minimum temperatures throughout the month is here reproduced for a few stations:—

	Mean Max. °	Mean Min. °
Perth Observatory	85·9	63·7
Marble Bar	109·0	77·0
Cue	103·8	73·7
Kalgoorlie	96·1	66·6
Fremantle	80·2	64·9
Bunbury	81·2	58·5
Cape Leeuwin	73·0	62·0
Albany	74·2	56·4
Breaksea Island	70·0	60·0
Esperance	81·0	60·0

The rainfall was unusually light, except in the Kimberley district, where very heavy floods occurred in connection with the tropical disturbance between the 9th and 17th. Wyndham recorded 195 points on the 9th, and then in succession 230, 998, 664, and 420; a total of 25·07 inches in five days.

The Climate of Western Australia during January, 1903.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					January, 1903.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
North-West and North Coast:															
Wyndham ...	29·791	29·728	30·060	29·790	95·7	79·3	87·5	105·0	71·6	98·0	78·8	113·0	69·0	2824	2824
Derby	29·811	29·750	29·932	29·641	97·3	79·5	88·4	107·8	71·0	94·1	77·3	107·0	68·0	347	347
Broome ...	29·816	29·743	29·934	29·635	95·0	79·1	87·0	105·5	72·0	91·7	77·6	102·5	68·0	83	83
Condon ...	29·790	29·758	29·913	29·673	95·8	75·6	85·7	104·8	70·4	94·9	...	106·0	...	Nil	Nil
Cossack ...	29·807	29·709	29·931	29·614	99·5	77·9	88·7	111·7	74·0	98·2	78·0	119·0	60·0	Nil	Nil
Onslow ...	29·845	29·773	30·120	29·650	95·0	73·0	84·0	114·0	63·0	97·8	72·7	121·0	51·0	Nil	Nil
Carnarvon ...	29·873	29·789	30·061	29·729	90·1	71·5	80·8	114·1	61·1	90·1	69·8	114·0	58·2	Nil	Nil
Hamelin Pool...	29·870	...	30·068	29·724	100·9	66·8	83·8	112·0	54·6	98·9	69·6	110·2	55·2	Nil	Nil
Geraldton ...	29·950	29·890	30·156	29·730	85·4	63·6	74·5	111·5	55·2	84·4	64·1	115·0	50·0	Nil	Nil
Inland:															
Hall's Creek ...	29·862	...	29·968	29·685	94·9	73·9	84·4	102·4	65·0	...	...	...	...	1697	1697
Marble Bar ...	...	...	...	...	109·0	77·0	93·0	117·0	73·0	...	...	...	...	49	49
Nullagine ...	29·788	...	29·967	29·602	105·4	74·1	89·8	111·8	66·8	...	...	...	...	34	34
Peak Hill ...	29·820	...	30·140	29·520	102·0	75·0	88·5	110·0	63·0	...	...	...	...	3	3
Wiluna ...	29·840	...	30·219	29·516	100·6	71·6	86·1	110·0	57·0	...	...	...	...	7	7
Cue	29·860	29·793	30·199	29·629	103·8	73·7	88·8	114·0	56·0	102·5	74·2	113·0	54·8	4	4
Yalgoo ...	29·865	29·804	30·180	29·580	102·0	70·0	86·0	114·0	54·0	100·5	70·5	110·5	54·0	Nil	Nil
Lawlers ...	29·867	...	30·298	29·507	99·8	72·4	86·1	110·9	58·6	...	...	...	...	17	17
Laverton ...	29·916	...	30·201	29·478	98·5	70·4	84·4	113·0	52·8	...	...	...	...	22	22
Menzies ...	29·965	29·845	30·370	29·600	97·0	70·0	83·5	110·0	53·0	95·8	68·4	113·2	48·0	180	180
Kalgoorlie ...	29·924	29·896	30·367	29·603	96·1	66·6	81·4	114·4	50·3	93·1	64·6	112·4	47·1	6	6
Coolgardie ...	29·935	...	30·360	29·644	96·2	64·4	80·3	113·4	49·2	93·2	62·8	112·2	46·0	24	24
Southern Cross	29·905	29·875	30·340	29·554	100·0	64·5	82·2	114·8	49·1	94·0	62·2	115·0	44·0	Nil	Nil
Walebing ...	...	...	...	...	95·8	62·7	79·2	110·0	49·0	...	...	...	...	1	1
Northam ...	...	...	...	...	96·4	63·6	80·0	111·0	52·0	...	...	...	...	Nil	Nil
York	29·960	29·902	30·370	29·690	96·0	62·0	79·0	111·0	51·5	91·7	63·5	115·0	45·0	1	1
Guildford ...	...	...	...	...	90·8	61·4	76·1	109·5	49·5	...	...	...	...	11	11

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during January, 1903—*continued.*

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					January, 1903.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST :															
Perth Gardens	29·998	29·935	30·339	29·788	88·5	65·7	76·1	108·3	53·5	88·0	62·6	116·7	46·0	2	2
Perth Observatory	30·000	29·939	30·334	29·785	85·9	63·7	74·8	106·1	53·1	85·5	63·8	107·0	51·5	2	2
Fremantle ...	30·028	29·929	30·374	29·821	80·2	64·9	72·6	98·0	54·5	81·8	62·8	108·0	47·0	8	8
Rottnest ...	30·002	29·902	30·320	29·793	78·0	64·4	71·2	102·2	54·0	80·6	62·5	104·5	50·0	2	2
Mandurah ...	...	...	...	...	86·5	60·3	73·4	102·4	47·0	...	...	...	...	17	17
Wandering ...	...	...	...	...	90·9	56·6	73·8	105·0	40·0	...	...	...	...	9	9
Collie	...	...	...	...	88·0	54·7	71·4	102·7	41·9	...	...	...	...	23	23
Donnybrook ...	...	...	...	...	87·6	56·4	72·0	101·5	41·2	...	...	...	...	3	3
Bunbury ...	30·016	29·960	30·373	29·776	81·2	58·5	69·8	96·0	37·2	81·0	58·2	101·0	42·0	6	6
Busselton ...	...	...	...	...	82·6	56·7	69·6	94·0	47·0	...	...	...	...	10	10
Bridgetown ...	...	...	...	...	86·3	51·7	69·0	102·0	39·0	...	...	...	...	8	8
Karridale ...	30·035	30·003	30·360	29·830	76·0	58·0	67·0	92·0	48·0	75·9	57·2	98·0	42·3	41	41
Cape Leeuwin	30·020	29·979	30·370	29·800	73·0	62·0	67·5	80·0	54·0	73·2	62·2	91·6	51·0	21	21
Katanning ...	29·980	29·958	30·370	29·730	91·0	55·0	73·0	109·0	44·0	87·9	54·8	111·0	41·0	11	11
Albany ...	30·043	30·024	30·399	29·735	74·2	56·4	65·3	101·8	44·0	70·7	58·8	99·0	45·0	24	24
Breaksea ...	30·043	...	30·410	29·750	70·0	60·0	65·0	92·0	52·0	69·3	59·3	86·5	51·5	24	24
Esperance ...	30·015	30·004	30·370	29·730	81·0	60·0	70·5	115·0	45·0	77·3	59·3	117·0	44·5	17	17
Balladonia ...	29·972	...	30·307	29·638	90·3	57·2	73·8	111·0	44·0	...	...	...	...	20	20
Eyre	30·018	...	30·394	29·780	82·6	60·6	71·6	111·0	42·2	...	...	...	...	7	7

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* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory, Perth,
11th February, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for December, 1902 (completed as far as possible), and for January, 1903 (principally from Telegraphic Reports).

STATIONS.	DECEMBER.		JANUARY.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
EAST KIMBERLEY:				
Wyndham	415	7	2824	15
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	..
Rosewood Downs	...	...	...	...
Argyle Downs	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek	150	7	1476	17
Plympton, St. Mary	...	...	...	...
Koojubrin	...	...	...	...
Hall's Creek	177	8	1697	13
Flora Valley	...	...	...	...
Ruby Plains	...	...	...	...
Denison Downs	...	...	...	...
WEST KIMBERLEY:				
Obagama	...	...	...	...
Beagle Bay	Nil	...	...	...
Derby	24	2	347	8
Yeeda	...	...	...	...
Liveringa	...	...	...	...
Mt. Anderson	...	...	...	...
Leopold Downs	...	...	...	...
Fitzroy Crossing	42	3	794	13
Fitzroy (C. Blythe	...	...	...	...
Quanbun	...	...	...	...
Nookanbah	...	...	...	...
Broome	Nil	...	83	1
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay	14	2	46	4
NORTH-WEST:				
Wallal	Nil	...	5	1
Condon	Nil	...	Nil	...
De Grey River	Nil	...	...	...
Port Hedland	Nil	...	Nil	...
Boodarie	Nil	...	...	...
Yule River	...	...	...	...
Warralong	Nil	...	...	...
Muccan	Nil	...	...	...
Ettrick	4	1	...	...
Mulgie	Nil	...	...	...
Eel Creek	...	...	...	...
Pilbarra	Nil	...	42	3
NORTH-WEST—*cont.*				
Coongon	Nil	...	...	...
Warrawagine	5	1	...	...
Bamboo Creek	Nil	...	103	3
Marble Bar	15	1	49	3
Warrawoona	15	1	230	2
Corunna Downs	Nil	...	...	...
Nullagine	25	2	Nil	...
Yandicoogina	...	...	...	...
Kerdiadary	Nil	...	...	...
Roy Hill	49	3	...	...
Mosquito Creek	...	...	...	...
Mulga Downs	Nil	...	...	...
Woodstock	...	...	...	...
Mt. Florence	15	2	...	...
Tambrey	25	1	...	...
Millstream	Nil	...	...	...
Yandyarra	...	...	...	...
Mallina	Nil	...	...	...
Whim Creek	Nil	...	33	...
Cooyapooya	..	...	...	...
Woodbrooke	Nil	...	...	...
Croydon	Nil	...	...	...
Balla Balla	Nil	...	Nil	...
Roebourne	Nil	...	Nil	...
Cossack	Nil	...	Nil	...
Fortescue	Nil	..	Nil	...
Mardie	Nil	...	...	...
Mt. Stewart	17	3	...	...
Yarraloola	Nil	...	...	...
Chinginarra	...	...	...	...
Onslow	Nil	...	Nil	...
Peedamullah	Nil	...	...	...
Red Hill	...	...	...	...
Mt. Mortimer	21	1	...	...
Wogoola	...	...	...	...
Nanutarra	6	1	...	...
Yanrey	...	...	...	...
Point Cloates	...	...	...	...
GASCOYNE:				
Winning Pool	Nil	...	97	2
Towara	...	...	...	...
Ullawarra	...	...	...	...
Maroonah	...	...	...	...
Gifford Creek	Nil	...	...	...
Bangemall	Nil	...	...	...

RAINFALL—*continued.*

Stations.	December.		January.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Mt. Augustus	...	...	...	...
Minnie Creek	...	...	...	...
Yanyeareddy	Nil	...	...	...
Williambury	...	...	...	...
Wandagee	...	...	...	...
Bernier Island	2	1	...	...
Boolathana	Nil	...	...	...
Carnarvon	1	1	Nil	...
Cooralya	...	...	...	...
Doorawarrah	...	...	...	...
Mungarra	10	1	...	...
Clifton Downs	Nil	...	...	...
Dairy Creek	...	...	...	...
Upper Clifton Downs	100	2	...	...
Errivilla	117	1	...	...
Dirk Hartog Island	2	1	...	...
Sharks Bay	Nil	...	Nil	...
Kararang	...	...	...	...
Meedo	Nil	...	...	...
Tamala	Nil	...	...	...
Wooramel	Nil	...	Nil	...
Hamelin Pool	Nil	...	Nil	...
Byro	Nil	...	...	...
Yarra Yarra	7	1	...	...
Berringarra	Nil	...	...	...
Mt. Gould	...	...	...	...
Moorarie	...	...	...	...
Wandary	...	...	...	...
Peak Hill	55	2	3	1
Horseshoe	3	1	71	1
Mt. Fraser	16	2	...	...
Abbotts	18	1	4	1
Meekatharra	...	...	...	...
Belele	...	...	...	...
Mileura	...	...	...	...
Milly Milly	Nil	...	...	...
Manfred	2	1	...	...
New Forest	Nil	...	...	...
Billabalong	...	...	...	...
Wooleane	20	1	...	...
Murgoo	Nil	...	...	...
Meeka	6	1	44	1
Mt. Wittenoom	7	1	Nil	...
Nannine	20	1	6	1
Star of the East	Nil	...	Nil	...
Annean	15	1	5	1
Tuckanarra	7	1	27	2
GASCOYNE—*contd.*				
Coodardy	...	...	...	...
Cue	6	2	4	2
Day Dawn	4	1	5	1
Lake Austin	6	1	Nil	...
Lennonville	13	1	4	1
Mt. Magnet	3	1	5	1
Wurracoothara	4	1	2	1
Challa	Nil	...	Nil	...
Youeragabbie	Nil	...	...	...
Murrum	Nil	...	Nil	...
Burnerbinmah	6	1	...	...
Yalgoo	3	1	Nil	...
Gabyon	Nil	...	...	...
Wurarga	...	...	...	...
Gullewa	Nil	...	Nil	...
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	1	1	...	...
Mt. View	Nil	...	...	...
Mumby	12	3	Nil	...
Yuin	...	...	...	...
Northampton	10	2	Nil	...
Mt. Erin	Nil	...	Nil	...
Oakabella	...	...	...	...
Narra Tarra	...	...	...	...
Tibradden	...	...	...	...
Sand Springs	Nil	...	Nil	...
Mullewa	20	1	Nil	...
Kockatea	27	2	Nil	...
Bootenal	...	...	...	...
Geraldton	15	1	Nil	...
Greenough	Nil	...	Nil	...
Dongara	8	1	Nil	...
Dongara (Pearse)	12	1	Nil	...
Strawberry	...	...	Nil	...
Mingenew	17	3	6	1
Mingah	14	2	4	1
Rothesay	10	1	...	...
Field's Find	...	...	...	...
Carnamah	21	1	Nil	...
Watheroo	5	1	1	1
Dandaragan	10	1	5	1
Moora	8	1	Nil	...
Yatheroo	...	...	...	...
Walebing	13	1	1	1
New Norcia	42	3	Nil	...

RAINFALL—*continued.*

Stations.	December.		January.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	35	1	Nil	...
Belvoir	60	1	Nil	...
Mundaring ...	67	3	6	2
Guildford ...	22	2	11	3
Kalbyamba ...	51	3	...	...
Canning W't'r'w'ks	42	2	7	2
Perth Gardens ...	26	2	2	1
Perth Observatory	22	1	2	1
Subiaco	18	1	2	1
Claremont ...	42	2	2	1
Fremantle ...	20	2	8	3
Rottnest... ...	16	2	2	1
Armadale ...	...	...	...	...
Rockingham ...	40	1	25	2
Canning River ...	...	...	...	...
Jarrahdale ...	71	2	34	3
Mandurah ...	20	1	17	1
Pinjarra	42	2	Nil	...
Yarloop	54	5	10	2
Harvey	53	4	14	2
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley ...	19	1	Nil	...
Momberkine ...	6	1	...	...
Mouglin ...	11	1	Nil	...
Newcastle ...	15	1	Nil	...
Eumalga ...	22	3	Nil	...
Northam ...	38	1	Nil	...
Grass Valley ...	40	1	...	...
Meckering ...	48	2	Nil	...
Cunderdin ...	...	...	...	...
Codgen	21	1	Nil	...
Jarragin... ...	7	1	30	1
Doongin... ...	28	2	...	...
Cuttening ...	60	2	Nil	...
Whitehaven ...	Nil	...	...	...
Sunset Hills ...	21	1	Nil	...
Cobham	27	2	Nil	...
York	44	2	1	1
Beverley ...	6	1	Nil	...
Barrington ...	...	...	Nil	...
Stock Hill ...	39	2	2	1
Sunning Hill ...	10	1	Nil	...
Wandering ...	20	2	9	1

Stations.	December.		January.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST—*contd.*				
Pingelly ...	...	...	Nil	...
Marradong ...	45	1	9	1
Bannister ...	40	4	4	1
Narrogin ...	31	3	Nil	...
Wickepin ...	17	2	...	...
Gillimaning ...	16	1	...	...
Bunking ...	9	1	Nil	...
Bullock Hills ...	4	1	2	1
SOUTH-WEST DIVISION (SOUTHERN PART):				
Bunbury ...	28	4	6	2
Collie	49	5	23	3
Salvation Army Settlement	...	...	...	...
Glen Mervyn ...	169	9	20	2
Dardanup ...	84	4	...	...
Donnybrook ...	63	4	3	1
Boyanup ...	57	5	26	2
Ferndale ...	...	...	...	...
Busselton ...	40	8	10	3
Lower Blackwood	50	3	Nil	...
Karridale ...	109	8	41	6
Cape Leeuwin ...	75	14	21	7
Biddellia ...	102	5	31	3
The Warren ...	113	7	63	6
Lake Muir ...	54	6	...	...
Mordalup ...	36	9	...	...
Deeside	55	8	...	...
Riverside ...	32	2	...	...
Balbarup ...	67	7	19	4
Wilgarup ...	78	5	13	2
Mandalup ...	100	7	21	3
Bridgetown ...	109	5	8	3
Greenbushes ...	134	3	Nil	...
Greenfields ...	91	4	12	1
Glenorchy ...	82	4	...	...
Williams ...	35	2	3	2
Arthur	22	4	4	1
Darkan	42	2	4	1
Wagin	12	3	1	1
Glencoe ...	22	3	Nil	...
Dyliabing ...	18	3	1	1
Katanning ...	14	1	11	1
Kojonup ...	34	2	16	1
Broomehill ...	12	4	13	2
Sunnyside ...	18	4	14	3
Woodyarrup ...	13	4	2	1

RAINFALL—*continued.*

Stations.	December.		January.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West—*contd.*				
Cranbrook	29	3	...	...
Blackwattle	27	2	Nil	...
Mt. Barker	57	5	30	5
Kendenup	24	3	2	1
St. Werburgh's	66	10	...	...
Forest Hill	59	10	21	3
Denmark	12	1	...	...
Grasmere	76	8	47	6
Albany	59	11	24	5
Point King	57	3	25	2
Breaksea	52	14	24	9
Cape Riche	11	2	12	3
Pallinup	25	3	4	1
Bremer Bay	47	4	4	4
Jarramongup	...	...	5	1
Eastern Division:				
Lake Way	9	5	7	2
Mt. Sir Samuel	25	2	15	2
Lawlers	53	4	17	3
Leinster G.M.	98	1	8	2
Sturt Meadows	20	1	...	...
Mt. Leonora	10	3	6	2
Mt. Malcolm	5	1	Nil	...
Mt. Morgans	18	3	30	1
Burtville	18	2	Nil	...
Laverton	48	3	22	1
Murrin Murrin	13	2	21	2
The Granites	48	2	2	1
Tampa	Nil	...	7	1
Kookynie	13	1	11	1
Niagara	11	5	11	2
Yerilla	15	2	6	2
Edjudina	52	4	...	...
Menzies	7	3	180	2
Mulline	45	1	10	1
Waverley	6	1	Nil	...
Goongarrie	20	1	4	1
Mulwarrie	4	1	11	2
Kurawa	4	1	Nil	...
Kurnalpi	7	2	1	1
Bulong	16	3	6	1
Kanowna	19	1	5	1
Kalgoorlie	14	2	6	1
Coolgardie	17	3	24	3

Stations.	December.		January.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Eastern—*contd.*				
Burbanks P.O.	21	4	26	2
Burbanks Birthday Gift	16	2	22	1
Woolubar	Nil	...	...	...
Widgiemooltha	27	3	12	2
50-Mile Tank	8	1	Nil	...
Waterdale	25	3	...	...
Norseman	67	4	4	1
Bulla Bulling	49	1	Nil	...
Woolgangie	22	2	...	...
Boorabbin	16	1	Nil	...
Karalee	80	3	Nil	...
Yellowdine	35	2	Nil	...
Southern Cross	17	1	Nil	...
Mt. Jackson	...	...	...	...
Bodallin	33	2	Nil	...
Burracoppin	25	1	15	1
Kellerberrin	23	1	Nil	...
Mangowine	Nil	...	4	1
Wattoning	31	1	...	...
Eucla Division:				
Ravensthorpe	43	5	10	1
Coconarup	71	8	...	...
Hopetoun	25	4	9	1
Fanny's Cove	22	3	Nil	...
Park Farm	75	4	10	2
Esperance	42	4	17	4
Gibson's Soak	146	5	7	2
30-Mile Condenser	150	6	5	1
Swan Lagoon	95	6	...	...
Grass Patch	85	6	2	1
Myrup	74	6	19	2
Lynburn	82	5	...	...
Boyatup	165	5	8	2
Point Malcolm	132	3	...	...
Israelite Bay	135	4	1	1
Bulbinia	188	6	...	...
Frazer Range	162	4	...	...
Balladonia	183	5	20	8
Southern Hills	198	4	...	...
Eyre	139	9	7	1
Madura	291	8	...	...
Mundrabillia	207	7	...	...
Eucla	312	7	11	2

The Observatory, Perth,
11th February, 1903.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during January, 1903.

NAME OF PORT.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of														
					Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomeloes.	Pines.	All other fruits.
FREMANTLE ...	12528	11195	1333	1333	254	523	923	2065	41	2224	...	2225	...	45	2740	...	94	17	44
ALBANY	1206	1187	19	19	205	98	32	14	...	199	52	54	...	114	416	1	...	...	2
GERALDTON ...	137	123	14	14	35	...	...	...	...	...	...	...	...	33	55	...	...	...	...
ESPERANCE ...	40	40	...	...	6	...	..	...	...	...	4	4	...	13	13	...	...	...	...
TOTAL ...	13911	12545	1366	1366	500	621	955	2079	41	2423	56	2283	...	205	3224	1	94	17	46

Department of Agriculture,
5th February, 1903.

Return of Fruit Trees and Plants imported into Western Australia during January, 1903.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.														
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	6	2392	6	2392	...	...	...	2292	...	...	...	...	...	...	...	...	...	...	...	...	...	...	100
Albany ...	1	47	1	47	...	...	...	47	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	7	2439	7	2439	...	...	...	2339	...	...	...	...	...	...	...	...	...	...	...	...	...	...	100

Department of Agriculture,
5th February, 1903.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

NOTES.

THE CONFERENCE.—The Producers' Conference, which will be opened in Perth on the 24th inst., promises to be of unusual interest. A good attendance is anticipated, and it is hoped that useful work will result.

THE DIRECTOR.—We are pleased to announce that the Director of Agriculture, Mr. Wm. Paterson, has again taken up the reins of office. He has the appearance of enjoying good health, which, after the very severe bout of illness that he has just recovered from, must be a source of gratification to all who know him.

SPARROWS.—A report has been received by the Department that sparrows have been seen in the vicinity of the Gardens, St. George's Terrace, Perth. It is hoped that persons locating any of these little pests will at once communicate with the Department, so that immediate steps may be taken in order to destroy them.

ROTATION OF CROPS.—It has never been known that the same crop could be grown with success year after year on the same land. Experiments show that excellent crops of wheat, barley, and mangel may be continuously obtained if appropriate manures are annually applied and the land kept free from weeds. A rotation of crops is resorted to in ordinary practice in consequence of the facilities which such a plan affords for cleaning the land, and from the greater economy of manure which results from this practice. One of the chief aims in adopting a system of rotation is to bring the land into a condition suitable for growing cereal crops; this condition consists in the accumulation of nitrogenous matter in the surface soil.

PRESERVES IN BRICKS.—The Kansas City *Packer* relates that the newest form of preserved fruit is bricks, which are either rectangular or disc-shaped, and done up in oiled tissue paper. They are of about the consistency of a soft gum-drop, and, being composed largely of sugar, they hold the flavour of the strawberries, peaches, pears, plums, or what not admirably. These bricks will soon be on the market in large quantities from California, experiments in their manufacture having attained final success. They are made by boiling down the fruit pulp to a sugar until the desired consistency is reached, when the mixture is poured into pans and permitted to dry slowly for ten hours, being eventually cut into suitable pieces and wrapped in the manner described, They will keep perfectly good in condition for years.

GRASSHOPPER PLAGUE.—The effect of the "fungus" supplied by the New South Wales Government entomologist for destroying the grasshoppers in the Warragul district is being made manifest by the numbers of dead insects which have been found on several of the farms in the neighbourhood. Many farmers declare in all seriousness that the grasshoppers are now eating as much grass as the stock, and the work of exterminating the pest should be made compulsory on every farmer, in the same way as with the rabbits. Since the full details concerning the use of the grasshopper fungus were published, some time ago, there has been a very large demand for it in this district, about 160 tubes being distributed from the *West Gippsland Gazette* office alone, and requests for more are still coming to hand.

SHEEP WITH BLACKLEG.—When blackleg makes its appearance in a flock of sheep, each sheep should be at once drenched with a purgative dose of either Epsom salts or Glauber's salts, and this should be followed with either 2 drachms of hyposulphite of soda, or ½ drachm of chlorate of potash, given to each sheep every alternate day for ten days or a fortnight. The hyposulphite of soda is most easily given by dissolving in water and sprinkling it on the food. The chlorate of potash may be mixed with toppings or other fine meal and thoroughly mixed with the food. These medicines should be given when all the sheep are hungry, so that each gets its dose as nearly as possible. Blackleg is sometimes confounded with the more serious disease anthrax, when affecting sheep.

OUR FOOD SUPPLIES.—A summary of the general imports of food and merchandise from all countries into the United Kingdom during the past year enables us (says an English exchange) to form some conception of the vastness of our colonial and foreign trade, and at the same time to appreciate at their proper worth the obligations we are under to producers abroad for supplying us with the necessaries of life in the shape of food and drink. These two essentials alone represented a total value of £224,619,761 in 1902, as compared with £224,585,117 in 1901, and £219,742,353 in 1900. Observing the same arrangement here as that carried out in their returns by the Custom House authorities, by including "tobacco" with articles of food and drink, and separating produce that enters our ports "duty free," and from that which is classed as "dutiable," we discover the fact that the two great divisions of our nation's importations are pretty nearly to equal amounts. That is to say, the items admitted free of duty in 1902 were valued at £109,721,317, against £107,102,412 and £102,720,325 in the previous years; whilst the goods subject to duty were estimated to be worth £114,798,444 sterling, as opposed to £117,482,705 and £117,022,038 in 1901 and 1900.

DISHONEST JUDGES.—William McNabb, a well-known sheep-farmer in the Morwell district, Victoria, was placed on his trial in Melbourne on the 15th of last month, together with Lawrence Henry Rash, aged 18, and John Rash, aged 15, two of his employees, on a charge of conspiracy. The charge against the accused was that at Melbourne on August 5th last they conspired to defraud the Numurkah Agricultural and Pastoral Society and other societies offering prizes for sheep to be competed for, and to fraudulently obtain such prizes sheep were entered at Numurkah in the name of Rash Bros., although they belonged to McNabb. The latter was the sheep judge, and awarded the prizes to what were really his own sheep. After some evidence had been taken, McNabb's counsel intimated that his client would plead guilty. Counsel urged that if a fine were imposed it would meet the case. The Crown Prosecutor agreed to this. His Honour said he had formed the conclusion that this was a case for the imposition of a fine, and not imprisonment. From the avidity which the prisoner had shown to get money dishonestly, it was apparent that the loss of money would be regarded as an infliction. He had been guilty of shameful conduct. With regard to the boys, they were under his influence and under his orders, and they might have considered that they were merely carrying out their obligations to him in lending themselves to his dirty, shabby offence. He ordered the prisoner to pay £500. McNabb wrote out a cheque in the dock, and remained in the custody of the sheriff until it was cashed. A *nolle prosequi* was entered against the boys, who were discharged.—*Exchange.*

FRUIT IMPORTATIONS.—The following letter taken from an Adelaide paper goes a long way to show that the work done by the Department's Inspectors at Fremantle is not only preventative of checking the introduction of disease, but also compels shippers to send good fruit for our markets:—"Sir,—As one interested in the fruit industry of South Australia, I would like to call attention to the way in which fruit is shipped hither from your State. I have made frequent visits to the fruit sheds in Fremantle during the past fortnight to see for myself how the fruit arrives. In two or three instances the plums have not really been worth picking over, arriving here rotten and mouldy. The fault lies principally with the gardeners. I would like some of them to see their own plums when they get here. How is it that ten cases of diamond plums can come here as sound as one could wish, and perhaps the next ten all rotten? It is because they were packed too ripe in the first place. It is a downright shame for gardeners to pack inferior fruit to Western Australia. If the fruit were more carefully packed, and not packed too ripe, the importers on this side would order more heavily. But when only 12 cases are good out of 25, and so on, it makes the importer chary of ordering too many. I have seen plenty of cases come here half full, which could not possibly shrink so much on the voyage over. More than one-half the apples that come here are condemned through the presence of codlin moth, and, unless this alters, importers here will give South Australia a spell and go to Tasmania, where they say they can depend on the fruit, and have no trouble in getting it through the inspectors' sheds.—Yours, etc., WALLACE SMITH, of Norton's Summit, S.A. Fremantle, 13th January, 1903."

TROPICAL FRUITS.

By A. Despeissis.

Of the several Australian States, two, Queensland and Western Australia, possess natural conditions which permit of the profitable cultivation of tropical crops and fruit. It is true that South Australia also owns a Territory in the tropics, but its distance from the populous markets of the more temperate latitudes will always prove a formidable obstacle in the way of providing the southern markets with productions of tropical latitudes. The cultivation of the sugar cane has already proved highly remunerative in Queensland, and other crops as well await development at the hands of settlers in the warmer latitudes of both States.

Coffee, cocoa, cotton, and tea also grow with great luxuriance, but at present would prove risky ventures, on account of the lack of suitable labour to exploit them.

Tropical fruits stand differently. To the increasing number of settlers on the sea board of tropical Western Australia they would prove a blessing and a luxury, whereas the population at the South could absorb large quantities of such of the delicious tropical fruits which are capable of being raised at the Nor'-West and the North. Among such crops are:—

ALLIGATOR or AVOCADO PEAR (*Persea gratissima*).

Is a native of Mexico and Brazil, whence it was introduced into the West Indies. The tree, which has somewhat the appearance of the apple tree, is a fine spreading evergreen, with leaves large, oblong, and smooth, and of a bright green colour. The tree bears towards the extremity of the branches, the fruit being in appearance not unlike large pears. They weigh up to 2lbs. each. They consist of a single large rugged seed wrapped up in a membranous cover, inside a firm buttery flesh of a bright greenish yellow colour, which contains about eight per cent. of greenish oil. The skin, which changes from bright green to yellow green, is tough and leathery, and when the fruit is ripe can be peeled clean off the pulp, to which it firmly adheres until then. Very unpalatable when green, it is deliciously melting, with a delicate fresh walnut flavour, when ripe. In the tropics it is also sometimes eaten with pepper and salt or with sugar and kirsh.

The Avocado Pear thrives as well beyond the tropics, and should be an acquisition to the orchards from Sharks Bay northward. It is easily grown from seeds or from young cuttings. It requires moist soil, and is unsuited for droughty localities. When marketing it should be picked before it becomes soft, and should be carefully packed when it ripens in a week or 10 days after gathering.

BANANA and PLANTAIN (*Musa sp.*)

Hitherto Western Australia has been drawing supplies of this fruit from Fiji and Queensland. On account of the protracted time required in shipping them from the extreme East to the West coast of Australia, the fruit we receive is of very indifferent quality. It has to be picked before it is fully developed and when quite green, and it therefore ripens in an artificial manner in the crates used by the shippers. During the year 1902 over 17,000 crates of bananas were imported, mostly from Queensland and from Fiji. These, at an average value of 20s. to 24s., represent for our then population of 212,000 people a considerable sum for this article of food alone. Bananas are introduced in our market during the winter and spring months when all fruits are scarce, and there is no reason to doubt that considerably larger quantities would readily be consumed if better fruit grown nearer our own market was obtainable, more especially if sold at a lower price.

The Banana may be said to be one of the most useful productions of the vegetable world. Its fruit, either in the green or the ripe state, is highly nutritious; its stem yields a valuable fibre, and it affords, in tropical climates, a protecting shade as well also as material for thatching, mats and baskets, and an endless variety of articles of everyday use.

Bananas are great exhausters of the soil. They require rich, moist soil; as the eating varieties do not seed, nature provides them with numerous suckers. In some places these suckers are grown at intervals of about 12ft. to 15ft. in trenches 1ft. or more deep and about 3ft. wide. Every now and again a good dressing of cow-dung and a copious watering is given, and for that purpose the trench system is very suitable. Where the soil is naturally very rich and moist the trenches are dispensed with. Three or four stems are left to each clump, and all the other suckers are cut off with a sharp spade and either removed for planting or left to rot on the ground, together with the chopped up stems which have just fruited. This form of mulching keeps the ground cool and checks the growth of the weeds.

The banana is essentially a hot climate plant. In some sheltered and favoured parts of the more temperate zone it may be made to grow and even fruit, but the plant never attains the luxuriant growth, nor is it as fruitful as within the more congenial tropical regions. Protection from the withering blasts of high winds is essential, and if properly protected they can be grown quite near to the sea coast in an atmosphere charged with salt. The suckers used for planting should be about a couple of feet long, and four or five months old. When smaller they are delicate; when longer they do not root so easily. As many fibrous roots as possible should be secured when cutting them off the parent plant. In a little over a year's time, in favourable localities, the first stem flowers and bears a bunch of fruit, which takes four or five months to develop. That first bunch is, as a rule, not so fine as that from the second sucker and the few which succeed it. After a few years the ground becomes impoverished, and needs stirring up and manuring. Complete chemical fertilisers, at the rate of 1½lbs. to 2lbs. per clump, can be applied. Under favourable circumstances a banana plantation remains profitable for seven or eight years. Each adult stem bears one bunch, which consists of a long stalk with fronds consisting of half-a-dozen to a dozen fruit symmetrically arranged round it. The bunches, according to variety and size, weigh from 10 to 60lbs. each and over. All banana trees are good bee plants.

As regards its food value, the banana is more nutritive than the potato. It contains 27 per cent. of dry nutritive matter; the potato gives 25. The 27 per cent. of dry matter are approximately made up of 2 per cent. of nitrogenous matter and 22 per cent. of saccharine substances, with small quantities of fibre and ash constituents. Of the ash constituents, potash represents 50 per cent. and phosphoric acid 15 per cent.

The plantain is gathered at different stages. When three-fourth's grown it is rather milky and contains much starch. At that stage, if boiled or roasted in ashes, it is almost as nourishing as bread. Shortly after this stage, when full grown but still green, it is not so starchy, but contains more sugar. In this state it is eaten as an accompaniment to meat. Lastly, when quite ripe it becomes sugary, and is then eaten either raw, roasted in ashes, or in the form of fritters.

The banana is seldom eaten cooked in the unripe stage, but is allowed to mature, when it is soft, full of sugar, melting, and is possessed of a peculiar perfume.

The banana is not left on the plant until fully ripe, but is cut about a week or ten days before. If intended to be shipped long distances the spike is cut even earlier, and the fruit gradually becomes yellowish and more sugary. When transferred to market it need be handled with the greatest care, as a bruise that may not be apparent at the time will soon cause decay of the delicate tissue of the fruit. They are packed in crates with open slats, and should be stacked on deck in the open air.

The varieties of bananas cultivated in various countries may be numbered by the score. Two groups are known, viz., the edible and the fibre-producing sorts.

The edible bananas are often referred to as "Bananas" or as "Plantains," and a good deal of confusion has in consequence resulted. Perhaps the best distinction is to designate as "Plantains" those varieties which are generally consumed cooked, and "Bananas" the varieties which are eaten fresh and ripe. As a rule the stem of the first is green and that of the latter somewhat mottled.

PLANTAINS (*Musa parasidiaca*).—Long, large fruits. The Dacca plantain is about nine inches long, the Madagascar plantain as large as a man's forearm; whilst it is reported that in the Philippines a couple of fruit of plantains are a load for a man. The trees are 15ft. to 18ft. high. The fruit is cut before maturity, when rich in starch, and cooked or allowed to ripen and eaten when sweet.

Brahmine Banana (*M. Sapientum*) is small. A native of India; its cultivation has spread all over the semi-tropical world. The tree is tall, reaching 18ft. in height; should be planted in well sheltered and warm spots. The fruit, eaten when sweet and ripe, is of the best.

Chinese Banana (*M. Sinensis* or *Cavendishii*) is a comparative dwarf species and a squatter plant with large, long leaves, and attaining a height of five or six feet. It produces excellent fruit, stands high winds better than the preceding; is altogether more hardy and stands a greater amount of cold weather. The tree bears early most excellent fruit.

BREADFRUIT (*Artocarpus incisa*).

The botanical name is derived from the word *artos*, bread, and *carpus*, a fruit, and the generic name *incisa* in contradistinction to the genus *integrifolia*, or entire leaved, which applies to the Jackfruit.

This plant is distinctly tropical, and requires for growing and bearing a deep moist soil, well sheltered in a uniformly warm climate. A handsome evergreen tree, 20 to 30 feet high, it has its native habitat in the islands of the Pacific and the Malay Archipelago, whence it has been introduced into Mauritius and Madagascar, where it thrives well. Such glowing accounts were given of this fruit by the early navigators, that steps were taken to introduce it into the West Indies towards the end of the eighteenth century, and the expedition, which was connected with the historical mutiny of the "Bounty," first failed to achieve that end. A second attempt was however made and again entrusted to Captain Bligh, who succeeded, and the tree has since become quite common in the West Indies.

The breadfruit together with the banana form a staple article of food of the islanders of the Pacific. The average size of the fruit varies from that of a child's head, and often weighs 30lb. and more. It is more or less round or oval in shape, and is carried on the stem, and the main branches. Externally it is not unlike the Jack-fruit, which was illustrated last month. The outer rind is rough, and covered with diamond-shaped facets. The inside is a white fibrous pulp, becoming succulent at maturity, when it is rich in starch. Eaten boiled or baked, it tastes of dough, with a pleasant nutty flavour, and is very sustaining. Like the plants of the same family, the breadfruit tree exudes, when freshly wounded, a sticky latex which is as strong as bird-lime. The breadfruit would, I dare say, thrive in the Kimberleys and the more tropical regions of this State. It is propagated from root-cuttings, which readily sprout and from which shoots can be detached, with a heel attached. In tropical West Africa another tree belonging to the same natural order exists. It is chiefly grown for the sake of its seeds which, roasted or boiled, taste somewhat like chestnuts.

Bullock's Heart (*Anona reticulata.*)

One of the "Custard Apples," constituting a fine evergreen tree 30 to 35 feet high.

Bullock's Heart (*Anona reticulata.*)

It grows readily from seed. The fruit is larger than a pear, and its shape has won it its name; in colour it is a brown chestnut. The pulp inside is eaten with a spoon and is much liked. In the tropics the tree is vigorous and prolific. The fruit should be picked when hard and ripens a week or 10 days after gathering.

The illustration is from *L'Agriculture pratique des pays Chauds.*

CUSTARD APPLE, syn. CHERIMOYER (*Anona cherimolia*).

A native of Peru. The tree, which grows 10 to 12 feet high, requires rich, moist soil, in a well sheltered place. The leaves are oval, the flowers very fragrant and solitary, the fruit globular or heart-shaped, three or four inches in diameter, greyish-green, turning to brown when ripe. The flesh, in which some 30 or 40 hard brown seeds are embedded, is much relished, the fruit being eaten when soft and yielding to the touch. For marketing it needs gathering when hard, a week or so before eating.

Two other custard apples, the SOUR SOP (syn. Corossol), *A. muricata*, and the SWEET SOP, *A. squamosa*, are trees of the same family which are grown in the tropics and valued for their fruit.

THE GUAVA (*Psidium*).

One of the hardiest of all tropical fruits, its cultivation can, in favourably situated places, be extended to semi-tropical regions, and in Western Australia it flourishes alongside the orange, the apple, and the pear. In the cooler regions the Guava is easily kept within bounds, whereas in the tropics birds and cattle freely distribute it over wide areas, while its easy suckering habits under the tropics cause it to spread wherever it grows. The tree is an evergreen, varying in size from that of a shrub three or four feet high to a tree of 12 to 15 feet. It grows readily from seed, cut-

The Guava Branch and Fruit.

ting, or sucker. In size, the fruit varies from that of the tomato to that of a duck's egg, while species are even larger. The internal structure of the fruit is somewhat like that of the tomato. The flavour is peculiar and pronounced; it is not always liked at first, but cooked or stewed, with sugar or into a jelly, it is greatly relished by everyone. The crop ripens late in the winter, although some varieties bear fruit pretty well all the year round. The plant dislikes stagnant water, but grows readily on sand and clay alike, although a light loam suits it best.

THE LEMON GUAVA (*P. Guayava*) syn. *P. pomiferum.*—A shrub or small tree eight to sixteen feet high; leaves, four to five inches long by two inches wide, oval to oblong; lanceolate, smooth above, pubescent below, peduncles three to many flowered; fruit two to three inches in diameter, globose, yellow, aromatic, somewhat astringent. Very good for jellies and preserves. There are several varieties of this species which differ slightly in form, size, and colour. One variety is pear-shaped, the leaves are acute, peduncles one flowered, smooth skin, yellowish when ripe. This variety supplies most of the guava jelly of the West Indies; it is also preserved and canned as are other fruits.

BRAZIL GUAVA (*P. Araca*).—A shrub four to six feet high, growing in the West Indies, Guiana, Peru, and Brazil, where it is found in dry, high-lying places. Leaves oblong obtuse, soft to the touch above, somewhat hairy below; veins reticulate, somewhat raised; peduncles axilliary, one to three flowered. Fruit ovoid, greenish yellow, flesh white, of excellent taste.

STRAWBERRY GUAVA (*P. Clattleyanum*) or PURPLE GUAVA.—A native of Brazil and Uruguay. One of the hardiest of the guavas, thriving over a very wide range of latitudes. A shrub or small tree of five to fifteen feet high. Branchlets smooth, leaves smaller than those of the former round species, obovate, thick, and glossy, peduncles solitary, axillary, opposite, one flowered; fruit almost spherical, tapering at the eye, small, rarely exceeding 1¼ inches in diameter, fine deep claret colour, with numerous brown dots on a slightly roughened surface. Pulp, fleshy, soft and juicy, purplish red next the skin, but white at the centre, with a strawberry-like flavour and free from the strong odour of *P. Guava.*

Another species, the "Mexican Guava," sometimes called "Yellow Cattley Guava," is also cultivated, and has proved very hardy. In flavour it is somewhat tart, and possesses little of the peculiar guava smell.

JACK FRUIT (*Artocarpus integrifolia*).

For description and cultural notes regarding this tree the reader is referred to the last issue of this *Jonrnal,* which also contains an illustration of the fruit.

LITCHI (*Nephelium Litchi*).

A handsome evergreen tree, some 20 to 25 feet high, native of Southern China. The best sorts are propagated by grafting, seedling, or layering. Extensively cultivated in India, Ceylon, and in the coastal lowlands of Mauritius, where the excellence of the fruit has marked for it a prominent place amongst the best tropical fruits grown. At the time of ripening the heavy clusters of crimson fruit form a startling contrast with the dark glossy foliage. The fruit, which is roundish conical, consists of a large, smooth, oval, brown stone, covered by a pulpy arillus of a nearly transparent white, like jelly; sweet, with a delicate sub-acid flavour. The whole is encased in a rough, crimson shell-like covering.

The sun-dried fruits are largely exported from Canton and Hong Kong, and can be seen in Chinese greengrocers' shops of Perth.

LONGAN (*Nephelium longanum*).

The tree is much like the litchi, but taller; it is also hardier, and can be raised true from seed. The fruit is not so rough externally as the litchi, and, like it, is contained in a shell-like covering; it is roundish in shape, with a round brown stone covered by a pulpy arillus like the litchi, but not so palatable.

THE MANGO (*Mangifera indica*).

The mango, all the world over, is classed amongst the best of tropical fruits; few rival and none excel it. The tree is a handsome, large-spreading evergreen, which grows from 10 to 30 feet in height, and even more. It is a native of India, but is now widely cultivated all over the tropics and even in many subtropical countries. The leaves are lanceolate and the flowers in terminal panicles. In size, shape, colour, flavouring, and quality of flesh the fruit varies widely.

Its varieties range in weight from 2ozs. to 2lbs. each. In shape it is generally kidney-form, although some are roundish and flattened and others elongated and curved. The colour of the skin is generally green at first, although some are red or purple, and they assume, when ripe, a yellowish colour. Other varieties are mottled with various shades of red, while a few do not change colour at all in ripening. Between the skin and the kidney-shaped stone in the centre is the fleshy pulp, which is yellow, sweet, and luscious. The "tar and turpentine" flavour which some varieties are said to possess, is only applicable to inferior varieties. The better kinds have little or no fibre, and if they possess any trace of turpentine at all, it is not disparaging to the deliciousness of the flavour.

The list of varieties of mangoes would be a lengthy one. The Agri.-Horticultural Society of India publish a list of forty odd kinds, of which they sell grafts; forty varieties or more are known in Java; some thirty varieties or more are cultivated in Mauritius; while a great many are also known in the West Indies.

The mango does not reproduce true to name from seed, and, as it does not readily take the cleft graft, it is generally propagated by inarching. Grafted mangoes come into bearing in about five years after planting out. Varieties highly praised are: The *Alphonso* mango of India, the *August* mango of Mauritius, the *Strawberry, Carpenter*, and a host of other good sorts which would prove a great acquisition to our North and North-West provinces.

The mango is not only eaten when ripe, but large quantities are used green for pickles, chutney, or served raw with salt, pepper, and vinegar. The natives of India also use the leaves for its medicinal virtues.

THE PAPAW *(Carica papaya).*

For a description of this tropical fruit I would refer the reader to *The Producers' Gazette and Settlers' Guide of W.A.*, page 292, which contains a description of that tropical fruit, by Dr. A. Morrison.

PINEAPPLE *(Ananas sativa).*

A native of tropical America. This plant has been successfully grown in countries situate 28deg. North and South of the line, wherever the conditions of moisture, shelter, and soil have favoured its growth.

With us it is susceptible of growing in the open air in proximity of the seaboard as far South as Champion Bay, provided the annual rainfall be supplemented by judicious irrigation. Beyond this limit its cultivation may be extended even farther South under the protection of sheds, as is done in Florida, but under such artificial conditions pineapple culture ceases to offer commercial possibilities, and can only be attempted by amateurs.

Too rich soil does not suit the pineapple. It is intolerant of wet and retentive soils with any considerable proportion of clay. A deep free loam, permeable and fresh with perfect drainage, and which at no time becomes waterlogged, is the ideal soil for the pineapple. In Mauritius it is most successfully grown on friable volcanic soil. In other countries it does well on sandy soils, especially those of coraline formation, with a thin layer of vegetable mould on the surface.

The pineapple is a biennial plant, not unlike a miniature aloe' but the leaves are much thinner. Is seldom propagated from seeds' unless new varieties are desired. Most good pineapples, besides, are seedless, but seedling plants are generally very slow growers, and do not bear for 10 years or so.

The crowns or the tufts of leaves at the top of the fruit are sometimes grown, but they require two to five years to mature. For that reason the extensive propagation of this fruit is effected by means of slips and of suckers. The slips are produced from buds on the fruit stalks under the fruit. They are smaller than the suckers, but are more abundant. If it is intended to use them for planting, all but two are rubbed off; they are planted as quickly as possible after they mature, which takes place when the stem under the leaves turns brown. Slips fruit about 18 months after planting and produce fine fruit. Suckers which spring from buds below the soil, fruit about a year after planting. Two or three are generally left on the plant, which they replace after fruiting.

The plants are set in lines at distances of 5ft. x 2ft., if a horse-hoe is used; and 3ft. x 3ft. if manual labour is employed. The sets or suckers should have their basel leaves trimmed, and the contracted hard buds by which they are attached to the parent plant partly cut off. They are firmly set into the ground to a depth of 3in. to 4in. Fertilisers are worked into the ground between the rows. The practice of broadcasting chemical fertilisers is injurious to the leaves, as the salts of ammonia and of potash so used exert a caustic effect. Weeds should be kept down. After some years, and unless the suckers or rattoons are largely removed, the beds become almost impenetrable. The period of usefulness of a plantation lasts from five to eight years.

When the fruit is marketed to long distances, it is cut before it is quite ripe, a portion of the stalk being left attached, or else the fruit will bleed. The crown is also left intact, and should not be trimmed, so as not to rob the fruit of its decorative appearance. The pines are packed in large crates, but it is advisable to provide partitions in these crates, so as to separate fruit in lots of four to half a dozen each.

The varieties grown are either spineless leaves or spiny leaves. Of the spineless-leaved pineapple, the most commonly grown is—

THE SMOOTH-LEAVED CAYENNE (syn. Giant Kew).—Leaves long and smooth, or with very few spines, broad, dark green; flowers purple; fruit very large, pyramidal, dark orange yellow; flesh pale yellow, rich, highly-flavoured; pips large, flat. Does not sucker so freely as other varieties. A very handsome fruit, weighing 6lbs. to 10lbs. An autumn and winter growing variety. Largely grown in the Azores for the purpose of supplying the English market during the winter and early spring months.

Of the spine-leaved kinds, some of the best are—

BLACK JAMAICA (syn. Black Spanish).—Leaves long and narrow, dark green, almost a blue purple in the centre. The leaves are hollow, not open and flattish. The leaves have little hooked prickles; not spines like the teeth of a saw, but set distinctly from each other. Flowers purple; fruit oval, somewhat pyramidal, dark green at first, and fit to eat before it shows any yellow or red; pips middle-sized, prominent; flesh firm, yellow, rich, juicy, and highly flavoured. Weight of fruit, from 4lbs. to 5lbs. Ripens in the winter.

QUEEN.—Leaves very short, broad, of a bluish green, very mealy; spines strong, set widely apart; flowers lilac; fruit cylindrical, of a rich deep yellow; pips middle sized, prominent; flesh pale yellow, juicy, sweet, rich. Best in summer and autumn.

Ripley Queen.—Of these there are two varieties, green and red. The Ripleys belong to the Queen varieties. Leaves green with purplish longitudinal streaks running up the centre. As the plant gets old and weak, the purple streaks become irregular, and the green of the leaf yellow. The spines are numerous.

Other varieties cultivated are Abbaka, Black Antigua, Long, Green and Red Ceylon.

AGRICULTURAL LECTURES.

By A. Despeissis.

THIRTEENTH LECTURE.

Illustrations of Physical Geology.

[In explanation of the following notes, the lecturer used a set of charts of Johnston series illustrating some striking features of Physical Geology.]

A superficial knowledge of dynamical geology, or the change produced by the influence of *superficial and deeply subterranean* causes, is in many instances of great importance to the farmer.

The various superficial agents which modify the features of the crust of the earth are—

(1.) Those of the atmosphere, rain, air, frost.

(2.) Springs.

(3.) Brooks, rivers, glaciers.

(4.) The sea.

(5.) Plants and animals.

1. The *atmosphere* is that gaseous envelope about fifty miles thick which surrounds the earth. A mechanical mixture of about four vols. of nitrogen, one vol. of oxygen, and small proportions of water vapour (0·8 to 1·5 per cent.) and carbonic acid gas (4 –10,000 of air).

As a geological agent, the atmosphere effects changes by its varying temperatures and humidity; by its motions and by the chemical reactions of all its constituents, except nitrogen, which is totally inert.

Changes of Temperature.—Rocks contract or expand according to temperature. The perpetual strain causes the splitting and peeling of the superficial parts.

Frost, in countries subject to its influence, is one of the most potent agents of destruction.

Changes in Degree of Humidity.—The alternate drying and wetting of the surface of rocks bring about the loosening of the constituent particles.

Rain is another powerful agent of destruction, which is exerted in two ways—

(*a.*) Mechanically, by wearing down the surface of the rocks.

(*b.*) Chemically, by dissolving away certain rocks bodily or in part.

2. *Springs and Underground Water.*—The rain which sinks into the ground traverses the rocks below to an unequal extent, some being more porous or permeable to water than others, but all rocks are capable of containing and allowing of the passage to a greater or less extent of interstitial water.

The greater part of the underground drainage, however, finds its way through the cracks and divisional planes of rocks. In sinking downwards the surface waters tend to widen out the joints and dissolve rocks.

A *Spring* is the name applied to underground water where it issues to the surface of the earth, which may be the land surface or the bottom of a river, lake, or sea.

Springs are classified as Dip, Fissure, or Junction Springs.

Dip Springs are the most shallow of the three. They occur where beds of permeable and practically impermeable rocks dip out into valleys.

Fissure Springs are mostly of considerable depth. They are forced to the surface by hydrostatic pressure. They are the typical spring of the massive crystalline rocks.

Junction Springs are either shallow or deep-seated. They rise through fissure-planes due to the abrupt termination of the rocks, with others that are less permeable.

Wells.—The more superficial portions of rocks contain less water, owing to the atmospheric evaporations, than those of greater depth, which are often more or less saturated up to a certain varying limit, called the "water-level" or "table."

A well is a hole sunk down below this water-level, so that the water may percolate into it.

When water level is at a small depth (wells required are of course shallow), but in a vertical section of the earth's crust there are often successive water levels one above another, separated by impermeable strata.

3. *Brooks and Rivers.*—The chemical action of rivers is in the main similar to that of rain or springs, and the amount of material removed by most of them in solution in the course of a few years is enormous.

The mechanical work of a river is three-fold—

(1.) Transports loose materials (mud, sand, gravel, and boulders) from the higher to the lower levels.

(2.) Uses these in the further erosion of its channel.

(3.) Deposits them when its velocity is checked. Thus rivers have a constructive as wells have a destructive function.

FOURTEENTH LECTURE.

ROTATION.

"Tillage" and "fertilisers," we have seen, both enrich the soil and increase the yield of crops. There is another practice, though, followed in husbandry, the object of which is to extract from the land in a given period a maximum of produce, without impairing its productiveness. That practice is known as "Rotation," and it consists in having different crops on a field in successive seasons, and in so "rotating" these crops that they are not grown twice in succession on the same land, and that as many years as possible elapse between the repetitions of these crops.

Rotations improve the land, because—

(1.) Different treatments are applied to it in different years, and thus faults of one year are corrected the following year.

(2.) Each crop takes from the soil some ingredient in larger quantities than do other crops, and thus no one element of plant food is likely to be exhausted; but, on the contrary, a succession of other crops draws on the resources of the soil in a more equal manner.

(3.) One crop leaves the land in the best condition for another—as clover before corn—and improves the condition of the soil, or bring up food from the subsoil. Such crops are known as preparatory crops.

(4.) Weeds and blights are kept in check by a process of starving out.

(5.) Labour is economised, and convenience of working is studied.

(6.) Crops may consume food at different times. Some crops are shorter lived than others, and may require a richer soil than the other kind, not because it removes more food from the land, but because it requires more food.

CROPS.

What is a Crop?

Plants, either in the wild state or cultivated, fulfil functions of several kinds—

(1.) They aid in the improvement of the soil.

(2.) They influence the climate.

(3.) They supply food for animals, and also for various kinds of crops.

(4.) They supply products which are utilised by man in a variety of ways, and thus possess an intrinsic value.

"When plants are grown in quantity, they or their products constitute a crop." This crop may be a field of lavender, a field of wheat, or of potatoes or flax, an orchard of apples, a vineyard of grapes, or beds of cabbages or tomatoes, or a forest of wood or timber.

Out of something like 300 Natural Orders known to botanists, only some 30 or 40 contain species grown as farm crops, or garden, or medicinal crops.

Of Farm Crops proper, to which we will confine our attention at present, only some six or eight natural orders embrace the regular farm crops, susceptible of being cultivated in temperate climates, viz.:—

Gramineæ.—Wheat, Barley, Oats, Rye, Maize, Sorghum, Grasses.

Leguminosæ.—Beans, Peas, Pulse, Earth-Nuts, Lucerne, Sainfoin, Clovers, Vetches, Trefoil, Lupin.

Solanaceæ.—Potatoes, Tobacco, Tomatoes, and Cape Gooseberries.

Brassicaceæ.—Swedes, Turnips, Kohl-Rabi, Cabbage, Cauliflower, Kale, and Rape.

Chenopodiaceæ.—Mangolds, Beet, Spinach, and Salt-bushes.

Umbelliferæ.—Carrots, Celery, Parsnip, and Parsley.

Apart from the botanical feature and structural likeness which characterises these plants of the same natural order, there are other considerations which specially concern farmers—

(1.) Fertilisers exert on each plant of the same group a more or less like action, and therefore manures, or mixtures containing in larger proportion the same dominant manures, are applied to them.

(2.) Pests and Blights of similar kinds infest them, and are amenable to similar treatment, or prevention will be similar within each group, to a very great extent.

How Plants Grow.

In the first instance, a plant originates from a fertile germ. When surrounded with the proper conditions of (1) moisture, (2) warmth, and (3) air, that germ sprouts. That germ is contained in either a seed or a bud. All the modes of the propagating of plants grown by the farmer and gardener are but modifications of these two general types. From a centre that germ grows towards two diametrically opposite ends—one end (the root) penetrates the soil and grows downwards; the other (the stem) grows upwards, where light and air prevail.

Both roots and stem fulfil functions which are essential to the life and growth of the plant.

They are made up of cells; those cells are full of protoplasma and water, which causes them to swell to their utmost extent, and thus come into close juxtaposition with neighbouring cells, a flow of liquid holding in solution salts required in the building up of the tissues is thus passed on from cell to cell until it reaches from the root tips to the surface of the leaves.

The roots answer several purposes—

(1.) They absorb nutriment and sufficient moisture to convey it to the part above ground.

(2.) They steady the plant and form a foundation for the upper structure.

(3.) They carry on a necessary part of the respiratory work of the plant.

The tip of the growing root is hard, being protected by what is known as a "root-cap," which is inert, and gradually wears away as the root picks its way around obstacles. Behind that horny root-cap are the growing cells, which, as they are formed, lengthen the roots and cause them to penetrate further afield all around them; the roots are provided with elongated hairy cells or root hairs, whose function is to absorb moisture and nutriment, and to pass it on to the other cells of the root. These delicate hairs penetrate readily amongst the soil particles and cover an immense amount of space; their absorptive power is so great that water may be extracted from a soil apparently dry. That absorption gives rise to a pressure which directs the current upward. In fact, root pressure, together with this absorptive activity of the roots, cause the sap to ascend through the woody bundles of the plant, and, by means of these bundles, absorbed solutions are carried upward through all parts of the root and stem, and through the leaf-stalk veins, and all parts of the active leaf surface. The surplus water which is not required during the building-up process of the plant is thrown off by a process of evaporation known as "transpiration.

To aid transpiration, the leaves and green stems are provided with breathing pores connected with the delicate tissues within. These pores, or "stomata," open or close according as transpiration is more or less rapid. Dry air, winds which fan the leaves of the plant, and higher temperatures cause this transpiration to be more or less active. Whenever these circumstances prevail, and transpiration becomes more active than root absorption, the plant gives off more water than it receives, and it wilts.

Plants are made up of *water mostly*, and root-hairs effect the absorption of that constituent. Second in amount are bodies made up mostly of carbon and oxygen; these are absorbed by the breathing pores or stomata of the leaves, from the air. This absorption takes place during the day, and depends upon the green colouring matter of leaves—the chloriphyll—and upon sunlight. As a result of this action, carbon unites with hydrogen and oxygen the elements of water, ultimately forming *starch*, and *oxygen* is thrown off, which tends to purify the air. All night no carbon assimilation goes on, and plants which breathe like animals, and give off carbonic acid gas, only exhale that gas. The starch which results from this assimilation of carbon is stored in the leaves during the day and at night (when this assimilation is suspended) it may be entirely removed after being converted into soluble substances of the sugar class. Some of these soluble substances unite with elements taken from the soil to form more complex compounds used in growth, and the surplus is again converted into starch and stored in tubers (potatoes) stems or thickened leaves for future growth purposes.

The *external evidences* of growth are changes in form and size of the different parts. The *internal evidences* of growth are to be seen in the individual cells of which the plant is composed; new cells are made, and others are modified in size or form. It is probably impossible for a plant, however stunted it may be, to live without growing, but the growth may be so slight that the plant is no longer of any profit to the farmer.

COMPARATIVE CHARACTERISTICS OF FARM CROPS.

The simplest system of farming is to continually grow the same crop year after year.

In New Zealand, Australia, in Canada and other parts of America, this is still the common practice; but it can only be successfully carried on on rich soil (for a limited number of years).

In Virginia the soil was impoverished by growing oranges without intermission.

In Cheshire dairying was carried out so far that the soil at last began to get sick of producing milk, cheese, and butter, until the application of superphosphate and bones restored to the land what exactly had been taken away. Examples might be multiplied.

A variety of crops is, therefore, of great use in shepherding and lengthening the period of fertility of land, and a rapid consideration of the likings and the requirements of a number of our cultivated crops will guide the choice of the farmer in selecting fields and the season for sowing them.

Grain Crops.—These are of two kinds, "Corn" and "Legumes" or "Pulse." These two groups are widely dissimilar, while there exists a close relationship between the members of each group.

CORN CROPS.

Kind.	Depth of Root.	Period of Growth.	Soil Suitable.	Total Summer Heat Required.	Percentage of Grain to Straw.
Wheat	Deepest	Longest	Heaviest	Most	67
Oats	Medium	Medium	Medium	Medium	63
Barley	Shallower	Shorter	Lighter	Less	50
Rye	Shallowest	Shortest	Lightest	Least	47

Kinds.	Albumenoid ratio.	Latitude.
Wheat	5·4	Southern
Oats	6·7	Medium
Barley	6·8	do.
Rye	6·9	Northern

Innumerable variations are also noticeable even amongst wheat, oats, barley, etc. For whilst some are winter, others spring varieties, some bearded, others beardless, some dark, others dun colour and others white, some are hard and flinty, others softer and more floury, some will do well under circumstances which will be inimical to others. It is therefore important before going in largely for one particular kind of corn, to test it or ascertain whether it does well in the locality and under the circumstances it is proposed to grow it.

Out of eight or nine leguminous plants which are cultivated as farm crops, only two, beans and peas, are grown for their seed, the others are mostly cut for fodder.

ROOT CROPS.

Unlike grains or corn, which are annuals, roots are biennial, *i.e.*, they grow the first year and store up a supply of food in either their roots or other parts which is to be utilised for the promotion of flowering shoots and seed in a succeeding year.

The common ancestor of these roots did not possess to the same remarkable degree the present characteristics of a swollen stem, an enlarged root, or a big head; these characteristics have been purposely developed by the ingenuity of man with the aid of selection and intense cultivation.

Thus, the prototype of most of our root crops was the wild cole-wort of clayey shores (*Brassica oleracea*) from which have since sprung:—

Plant.	Part Developed.
Swede	Root
Turnip	Root and Stem
Kohl-rabi	Stem
Rape	Stem and leaves
Colsa	do. do.
Cabbage	Leaves
Kail	do.
Brussells Sprouts	Leaf buds
Cauliflower	Flower stalks

It is interesting to note the family likeness and features of several of these plants.

Kinds.	Percentage of dry matter.	Percentage of Nitrogen.	Percentage of Superphosphates.
White Turnips	9	·14	Least
Yellow do.	10	·15	More
Swedes	11	·16	,,
Mangolds	12½	·18	,,
Carrots	14	·23	,,
Parsnips	15	·26	Most

Kinds.	Root depth.	Drought resisting.	Period of growth.	Rapidity of growth.	Manure required.
White Turnips	Least	Least	Least	Greatest	Phosphates.
Yellow ,,	More	More	More	Less	
Swedes	,,	,,	,,	,,	
Mangolds	,,	,,	,,	,,	Nitrogen.
Carrots	,,	,,	,,	,,	
Parsnips	Most	Most	Most	Least	

Kinds.	Summer heat required.
White Turnips	Least
Yellow ,,	More
Swedes	,,
Mangolds	,,
Carrots	,,
Parsnips	Most

FIFTEENTH LECTURE.

Forage Crops.

Apart from these crops which are cultivated on account of the value of their seeds, roots, or fruits, as food *for man*, and which are called *alimentary*, there are others which are cultivated for *domestic animals* and are called "*forage crops.*"

Such crops are generally consumed in the green ripe state or if they are dried or otherwise cured, it is simply for the convenience of storing and of handling. Thus, corn crops dried for hay or ripened for seed are classed as "forage," as also may be cabbage, rape, turnips, etc. There are, however, a dozen or so which are grown specially for forage purposes. Their culture arose from the necessity of providing sustenance for the domestic animals on which the success of agriculture so much depends. Chief among these fodder crops are some widely cultivated "leguminous" plants with a few others which are cultivated and used like the grasses, though they do not belong to that family. Some of the characteristics of the most widely cultivated Forage Crops are interesting when contrasted:—

Kinds.	Dry matter (%)	Nitrogen (%).	Albumenoid ratio (1 :).	Suitable soil.	Root depth.
Vetches	18·0	·6	2·9	Clay	Least
Sainfoin	18·6	·7	3·0	Chalk	Medium
Lucerne	26·0	·75	3·1	Marl	Most

Kinds.	Drought resisting.	Summer growth.	Rapidity of growth.	Duration of life.	Manurial value of one ton.
Vetches	Least	Short	Slow	Annual	Least
Sainfoin	Medium	Medium	Medium	Perennial	Medium
Lucerne	Most	Long	Quick	Perennial	Most

Neither Lucerne nor Sainfoin are extensively cultivated in this country. Lucerne especially suffers much from long continued dry seasons, and is only successfully grown on naturally moist river flats.

CLOVER CROPS CONTRASTED.

Kinds.	Dry matter (%)	Nitrogen (%).	Albumenoid ratio (1 :).	Suitable soil.	Root depth.
Crimson Clover	18·0	·45	5 · 4	Loam	Shallowest
Broad Red „	18·5	·53	3 · 8	Clay	Deeper
Alsike „	19·0	·55	3 · 2	Clay	„
White „	19·5	·58	3 · 0	Marl	Deepest

Kinds.	Drought resisting.	Time of growth.	Rapidity of growth.	Duration of life.	Manurial Value.
Crimson Clover	Least	Shortest	Greatest	Annual	Least
Broad Red „	More	Longer	Less	Biennial	More
Alsike „	„	„	„	Triennial	„
White „	Most	Longest	Least	Perennial	Most

PASTURE.

The corn, root, and fodder crops already mentioned are generally grown singly and individually. In this as well as in others "pastures" differ. The botanical composition of the plants which constitute a pasture is complicated, but three classes predominate: grasses, legumes, and miscellaneous herbs, the last chiefly weeds, or at least plants of a comparatively inferior value.

In the first case of corn, root, and forage crops, everything is done to help the growth of the plant and exclude the others. In the case of pastures, everything is done to induce a number of different herbs to intermingle and grow amicably together. Unless the pasture is well tended, the strongest and coarsest plants obtain the mastery and oust the others. Amongst the many ways of checking the development of the coarse herbs and helping that of the good varieties are: Draining, liming, top-dressing with fertilisers, composts, marl, grazing by different class of stock, and occasionally sowing on and harrowing in some seed of some good varieties.

Among grasses a distinction is made between *natural* grasses and *artificial* grasses. Natural grasses comprise the true grasses or "graminae." They have long, simple, narrow leaves, with a long sheath divided to the base which encircles the stem. Each leaf has many fine veins or lines running parallel, with a prominent mid-rib in the centre. The stem is generally hollow and closed at the joints.

Artificial grasses are mostly leguminous plants or plants cultivated especially to be used with the grasses.

Pastures are composed of natural grasses, mostly of perennial growth. They are laid down with some idea of permanency, and are intended to be mowed or grazed for a succession of years.

Artificial grasses are, on the other hand, crops which are intended to only occupy the land for a year or two, in rotation with other crops. They are mostly annuals, and sometimes biennials, and are oftener grown singly, and rarely more than two species are sown together.

It is sometimes the practice when forming a pasture to sow one or more species of clover with the natural grasses. The clover first occupies the land for a year or two, and are subsequently replaced by the perennial grasses.

SEEDS.

Farm and garden crops are mostly grown from seeds, though some, such as potatoes and Jerusalem artichokes, are not.

"A seed is a miniature plant." It contains under one covering envelope all the essential organs of plant life, viz., a germ and a store of nutriment which is used up in enabling the young plant to commence its independent or individual growth.

It is evident that a proper selection of the seeds should precede sowing. "Bad seed is dear at any price." Incalculable sums of money are unconsciously or wantonly wasted every year through using bad seeds.

When a field is sown with bad seeds and the crops prove in consequence a failure, considerable loss is experienced.

The cost of tillage, of fertilisers, the rent of the land, as well as the cost of the seeds, are lost to the farmer, who is besides robbed of a season and of much valuable time which might well have been applied to some profitable purpose.

By means of careful selection, the standard of excellence of agricultural seeds has been advanced to a high state of perfection. "Pedigree seed" has been developed by picking out the best single grains from the best plants and re-sowing and re-selecting for a series of years until the average number of good points have been raised and made more or less permanent.

Careful harvesting, thrashing and cleaning; removing all light, small and weakly grains and all weed seeds and other impurities, all represent time and money well spent. On the other hand, the continual growing of a crop year after year from one's own seeds which have been indifferently harvested, and badly cleaned, will yield thin, weakly crops, which will fail to mature evenly. The seed is then said to have "run out," and a change is imperative.

In effecting a change of seeds a great amount of judgment is required. If a change of seeds is sometimes profitable, it also, at times, means a gigantic loss. Wellgrown seed from a better district will maintain its qualities for a couple of years or so. On the other hand, a change from an inferior district to a good one will improve that seed, and the crop raised from it, but that improvement will be effected at the cost of the farmer. Once it is ascertained that the seed from a certain district suits the condition of the farm where it is meant to be grown, it is wise to draw one's yearly requirements from that quarter rather than blindly experiment with seeds one knows little or nothing about.

SEED TABLE.

Kinds.	Weight per bushel.	Signs of Quality.	Quantity sown per acre.	Most common impurities.
Beans (dwarf)	64-65lbs.	Colour generally light brown, no smell, hardness	In drills, 1-1½bus.	
Beans (pole)			2bus.	
Buckwheat			5-6lbs.	
Cabbage	52lbs.	Dryness, freedom from mouldiness	In beds to transplant, ¼lb. In drills 2-3lbs.	Charlock.
Carrots		Dryness, not compact as it may have been heated	4-5lbs. in drills	
Clover, Red	65lbs.	Large proportion of purple seed, no dull brown seed, as they are dead	12-16lbs.	Dock, plantains, dodder sorrel, and shepherd's purse.
Clover, Alsike	65lbs.	Large proportion of dark green seed, no brown, ones permissible.	12-14lbs.	
White Clover	65lbs.	Light golden colour; very light ones weak in germination; brown ones dead	12-16lbs.	Do.
Crimson Clover or Trefolium	65lbs.	Light brown colour	12-16lbs. in drills 20-28lbs.	Docks and plantains easily cleaned.
Trefoil	In husks, 20lbs;		4-5bus.	Rarely unclean.
	shelled, 62lbs.		56lbs.	Burnet dock.
Sainfoin, Lucerne	62lbs.	No brown seeds.	20-26lbs.	Trefoil.
Vetches	64lbs.	Dryness, no black seeds	1-1½bus.	Small peas.

SEED TABLE—*continued.*

Kinds.	Weight per bushel.	Signs of Quality.	Quantity sown per acre.	Most common impurities.
Wheat	63-66lbs.	Bright, thin skin, no smell, plump grain, colour red, or white, according to variety. Dryness	½-1½bus.	Wild oats, Charlock, and wild onions.
Barley	54-56lbs.	Thin wrinkled skin, grain not shrunk, with small fine ends, pale white to light golden colour, no small grains.	1-1½ bus.	Charlock (easily separated from all cereals), and wild oats.
Oats	40lbs. and upwards.	Thin skin, plump grain, colour black or white, not brown, which indicates heating at some period.	1¼-2¼ bus.	Wild oats and charlock.
Rye	...	...	1-1¾bus.	
Maize	56lbs.	...	1bus.	
Peas	64-65lbs.	Dryness, and full size of the variety, colour white, blue, brown, and mottled. Black ones have been subjected to wet in field or sack and are useless.	1-1½bus.	Easily cleaned.
Turnips **Swedes**	52lbs.	Dryness, freedom from mouldiness.	31lbs.	Charlock.
Mangel	21lbs.	...	6-8lbs.	Coarse, rough seeds.
Potatoes	56lbs.	Firmness, tuber free from rot, and not too much sprouted.	10-15cwt.	

SIXTEENTH LECTURE.

QUANTITY OF SEED.

In deciding upon the quantity of seed required to sow an acre, several circumstances and conditions have to be borne in mind:—

(1.) The first desideratum is that the seeds should cover the ground, and each plant should have sufficient room to allow it to freely develop, but no more.

(2.) The nature of the ground, its fertility, the manure used and its preparations also influence sowing. Rich ground, well manured, favours rank growth, and more space is therefore required and less seed. Poor soil, on the other hand, means smaller growth, therefore more seeds are required to cover the land.

(3.) The quality and freshness of the seed; the habit of growth of the plant, the extent to which it is given to tiller or grow side shoots and spread on the ground; the question whether it is a rank grower or otherwise are also to be considered.

(4.) The season of sowing and the mode and amount of cultivation to be adopted will likewise weigh in the mind of the farmer when deciding what amount of seed to sow within permissible limits. The earlier the sowing the smaller the amount of seed is required, provided that the season be favourable—hence autumn sown wheat, oats, and winter grains require less seed than spring sown. If broadcasted, more seeds will be required than if the sowing is done with a drill, when the seeds will be deposited more uniformally.

(5.) Finally, the purpose for which the crop is grown influences the seeding. Corn grown for seed is sown thinner than corn grown for hay and chaff, other things being equal, thin sown crops grow slower, are more vigorous, and ripen earlier than a thick sown one.

A thick sown crop grows quicker, but the head is smaller, and the weight of the ear and the number of grains to a stalk less than in a thin sown crop. Experiments have been made which showed that four pounds of seed-wheat hand sown on well prepared ground gave almost as good results as one bushel (60) broadcast. This however, in actual practice means little or nothing.

PICKLING SEEDS.

Before sowing, and if doubt exists as to whether the seeds are healthy or not, it is a wise precaution to steep or pickle them.

Crops are attacked by insect and fungoid pests. The first are plainly visible, and for that reason can be fought with comparative ease and success. Fungoid pests, on the other hand, break out in a crop with great suddenness and give little warning of the coming invasion. Seeds apparently sound may be covered with the microscopic seeds of some of the most troublesome pests. These, if the season is unfavourable to their development may only do little or no injury; while if conditions be favourable they may take a hold of the field in a few days' time and baffle all attempts at checking their ravages.

In dealing with pests of that sort, an ounce of prevention is also worth a pound of cure. For many generations farmers have been in the habit of steeping their seeds—

(1.) In order to add to the store of nourishment the young plant is in need of; or

(2.) In order to ward off predatory birds and ground vermin.

Thus the time-honoured practice of steeping seeds in liquid manure or of coating them with tar.

In the first instance the seeds were impregnated with the liquid manure, which gives them a good start.

In the second, liquid tar is poured upon the corn, maize, etc., and the grain stirred until it is lightly covered. It is then dusted with dry lime and in that state sown, much to the annoyance of the all-devouring crow and other grain-eating vermin, which may take a few grains, but will soon leave off feasting on the sown seeds. A rather simple method practised by some farmers to check the sparrow and cockatoo pests at sowing time, is to soak the seed for a few minutes in water, and then while still quite wet to dry it on the barn floor with superphosphates. The seed is then ready for sowing and no birds will eat it or pull it up.

Seed pickling or steeping is also practised for another purpose, viz., to prevent the plant while fruiting from being attacked by parasitic fungi. Seeds often carry on the wrinkles or microscopic hairs of their outer covering the seeds or spores of vegetations which constitute "blights." It is essential in order to guard the crops against an invasion, to rid the seeds of these spores. For that purpose several means are used, viz., the seeds may either be steeped into a fungicide solution or mixture, or they may be immersed in hot water. It is essential that the time of steeping be long enough, or the pickling mixture be strong enough to destroy the fungus spore without retarding the germination of the seed or impairing its vitality.

The most common blights which attack wheat and other grain crops are known to farmers as "Bunt," "Smut," and "Rust." These we will consider later on, and will now merely mention the pickling which are used in combatting them. The usual method of pickling is to dissolve bluestone (or sulphate of copper) in hot water at the rate of ¼lb. to ½lb. to the gallon. This is enough for half a bag of corn. A quantity of the solution is made and put into a half barrel, into which a quantity of seeds tied up in a bag is immersed until the liquid has thoroughly penetrated it. It is then lifted out and placed on a cross piece over the tub to drain.

If large quantities of seed are handled, a more expeditious way is to pour the liquid over the seed grain heaped upon the barn or shed floor, and the grain is turned several times with a shovel. This is done the day before sowing, and as the water evaporates a thin coating of the sulphate is deposited on the grain.

Amongst other pickles which have been used with a certain amount of success is the Brine pickle. The brine must be strong enough to float an egg. The seeds are immersed for fully five minutes, then removed, drained, and sprinkled with some dry lime.

A favourable steep for oats, which are well protected by their husks, is Hot Water Steep. The seed oats are immersed for five minutes in water kept at a temperature of 127° F. to 133° F. That treatment, though not impairing the vitality of the seed, prevents an outbreak of the Smut fungus. A boiler kept going alongside the steeping tub, supplies the hot water for maintaining the temperature up to the requisite degree.

Corn seeds are not the only farm seeds that require special treatment previous to sowing.

Potatoes are often attacked by a troublesome fungus known as the "Scab," and a sure and easy method of ridding the tubers of the spores of that fungus consists of steeping them in a 2 per thousand solution of corrosive sublimate, also called bichloride of mercury (3ozs. in 10 gallons).

This solution being a violent poison, care should be taken to keep farm animals from getting access to it.

METHODS OF SOWING.

Seeds may be sown in various ways, viz.:—

(1.) Broadcast, by hand.

(2.) Broadcast, by means of machinery made for the purpose.

(3.) Drilled in.

(4.) With the dibbler.

The broadcast, or hand-sowing, which at one time was the only means of distributing the seeds over the prepared field, is fast disappearing from modern farming operations.

It requires some amount of practice to cast seed evenly by hand, so as to avoid sowing it thick or thin in patches.

The broadcast sowers first place bags of seed at convenient distances over the field to be sown. They themselves carry, about the level of the waist, a box capable of holding about half a bushel of the seeds. That box is suspended around the neck by means of a wide strap, conveniently a saddle girth, when sowing they walk in measured steps from headland to headland in straight parallel lines, using both hands in casting, the left hand throwing the seed to the right across the body, and the right hand to the left.

Machine seed sowers have since superseded hand sowing for large areas. The seed is fed into a hopper and is evenly cast fan-shape like in front of the sower. The heavier the seed, the greater the distance to which it is sown. According to the size of the machine and the character of the seeds from four to eight acres may be sown in an hour. It is necessary when seeds have been sown broadcast by hand or by machine that they should be covered by means of implements, such as harrows or the roller.

Where high-class farming is practised the seed-drill is now more generally used. It is necessary, in order that the machine should operate satisfactorily, that the land be in good tilth and be carefully ploughed and pulverised.

The advantage of the drill over the broadcast method are many:—

(1.) The saving of seed is considerable, and, in the case of corn, amounts from half to three-quarter of a bushel, or even more.

(2.) There is no harrowing or rolling required after drilling seeds in.

(3.) The seed is evenly deposited at such a depth where it finds the necessary amount of heat, moisture, and air necessary for its germination.

That depth can be regulated according to kind of seeds or time of seeding. Spring sowing generally requires greater depth than autumn sowing.

(4.) Any well pulverised and concentrated fertiliser may be put into the ground with the seed, and the growth of the plant may thus be promoted.

(5.) When the distance between the drills is wide enough, drill sowing allows cultivation by machinery which, in checking the growth of weeds and the escape of ground moisture, favours the crop.

GERMINATION.

Seeds kept in bags, in dry bins, or barns are susceptible of being stored for an indefinite period of time.

Directly they are intrusted to the soil, however, a marked change sets in; the seeds swell, they burst their outer covering, and sprout. They germinate. This phenomenon can be artificially brought on by any one, under circumstances such as shall permit of observation.

Amongst the several methods which may be employed a piece of ordinary red roofing tile and a shallow dish supply all the requirements needed.

The tile is placed in the dish, the seeds are laid on the tile, water is gently poured into the dish about half the thickness of the tile, the dish is covered by a piece of board and put away in a fairly warm room. The tile being unglazed, the water soaks through and rises to the upper surface and there moistens the seeds.

These soon swell, and after a few days a whitish, thread-like fibre grows out, which is known as the radicle, while at the same time a feathery growth comes out at the opposite end of the seed, and is called the plumule.

The question may be asked: What has stirred these seeds into life and caused them to germinate? In the first instance the seeds have absorbed some of the water which has risen by capillary force from the dish to the upper surface of the tile. Moisture is therefore the first requisite of seed germination, and so long as it is not present in the soil the seeds remain dormant.

A practical illustration of that fact is shown by wheat-growers in the drier inland districts of this State dry sowing their seeds weeks before the rainy season sets in, and not a blade of corn shows on the surface of the land until after the rain.

Another requisite of seed germination is sufficient warmth. It is remembered that in the experiment suggested the dish containing the moist tile and seeds is placed in a warm room.

Observation with the aid of the thermometer has shown that seeds, as a rule, do not germinate below a temperature 37° F. (O.C.=32° F.) This temperature is not, however, identical for all seeds and some need greater warmth than others.

If cold up to a certain limit will prevent germination of seeds there is also a limit of temperature above which germination likewise does not take place.

Between these two extremes of low and high temperatures we also find one which is most favourable to germination. This optimum temperature is not necessarily an average between the lowest and the highest as observation has also demonstrated.

The following table shows in degrees F. the lowest, best, and highest temperatures of some commonly cultivated farm crops:—

Seeds.	Lowest.	Best.	Highest.
Wheat	41	89	108
Barley	41	89	104
Maize	49	93	115
Peas	44	89	102
Pumpkins	56	93	115

As a rule, 40° to 50° is the lowest temperature at which farm crops germinate and 100° to 116° the highest, while 80° to 94° is the temperature of most rapid germination. It is also the temperature which prevails during the spring months.

The presence of air is a third requisite of germination, and this explains why it is that when seeds are too deeply embedded into the ground they fail to germinate.

SEED TESTING.

The selection of seeds is of greater importance to the farmer. In many countries laws regulates the sale of seeds and the dealer is required to guarantee the purity, authenticity, and vitality of the seeds.

With us these essentials are left to the honesty of the dealer and the good judgment of the farmer.

Seeds may have a low germinating power or may be mixed with foreign substances, which add to the bulk and the weight, or introduce troublesome weeds into the fields.

To protect himself against adulteration and from being imposed upon, farmers should examine all seeds before planting. With the aid of a pocket lens almost any kind of adulteration can be detected.

Seeds should also be tested for vitality. This may be done in various ways, as explained above.

HOW TO BREED AND RAISE THE CALF.

From "The Dairy Calf," by L. S. Hardin.

Will it pay to raise the calves to make the cows for increasing the herd, or filling the places of cows dropped from the herd?

Yes; it certainly will pay if the conditions are correct.

Let me briefly state what those conditions are, and what the treatment of the calves should be, and afterward consider at some length the arguments for and against the line of action recommended.

With everything suited to raising calves, it is pleasant and profitable work; but with one particularly weak point in the treatment, it is sure to be disappointing and unprofitable.

The man in charge of the calves should have good sense, an even temper, and take a lively interest and pride in his work, with ample time to attend to it properly.

He should have a separate stable for the calves, where they can be kept comfortable in wet, hot or cold weather, and have plenty of good implements to work with; and the master's eye should see that he keeps the calves dry, clean, and comfortable, and that all implements are kept perfectly clean and sweet.

To begin with: In order to have a good calf to work with, the bull that sires the calf must be a healthy thoroughbred, sired by a healthy bull from a healthy, good milking dam. The bull's dam must be a healthy and profitable milker. The bull must be worked, or otherwise exercised, and kept not too fat, but in good working order, and fed accordingly.

The calf's dam must be a profitable cow, in good working order, and from similar sire and dam.

Having these conditions, we are ready to raise the dairy calf that it always pays to raise.

Give each calf a name or number, and keep a record of it, with the date of birth, and name of sire and dam.

The cow should have been dry not less than six weeks, and fed during that time on grass or good hay and enough wheat bran to keep her in good thriving condition only—not allowed to get fat.

When ready to calve, she is given a comfortable box stall, or, if in summer, a lot by herself.

The calf when dropped is allowed to remain with the cow one day, and is then removed.

Feed it the dam's milk for ten days, three times a day, and just enough at each feed to fill its sides out evenly and comfortably, no more and no less.

If the feeder is governed by a certain number of pounds of milk for each feed, he will give a small calf too much, and a large one not enough.

As the calf grows slowly or rapidly the feeder must use judgment about the amount fed, increasing the food so as to allow the calf's stomach to gradually outgrow its other proportions, and always keeping a strict eye to the state of its bowels. If too loose, reduce the quantity fed, and when it recovers gradually increase the amount.

At ten days of age begin gradually to add skim milk to the ration, and reduce the amount of whole milk. Begin with one-eighth the ration skim milk, and increase it so that at the age of twenty days the calf is entirely on skim milk, if it has come on in good condition.

All milk fed must be perfectly sweet, and warmed up to between 90 and 100 degrees, no more and no less.

Have on hand a supply of flax seed meal, made by grinding the whole flax seed; make a jelly of this flax seed meal by stirring three tablespoonfuls into a pint of hot water, not boiling hot.

Do not feed cornmeal, oatmeal, cotton-seed meal, or meal made from ground oil cake.

If the calf comes on all right, at the age of fifteen days begin to add a teaspoonful of the flax seed jelly to the skim milk each time the calf is fed, gradually increasing the amount to a tablespoonful at each feeding. Regulate the amount of flax seed jelly fed by the condition of the calf, not allowing it to get too fat.

Always beware of increasing the milk, meal, or other food too rapidly.

When the calf is six weeks old give it a bunch of clean hay to nibble on, and a handful of dry oats in a box. Keep fresh water and a little salt before it, and increase the amount of oats as the calf grows, but not enough to make it fat.

After the calf is six weeks old the flax seed meal may be stirred into the skim milk, but if it sticks to the hairs about the calf's mouth it must be washed off, or it will cause the hair to come out, giving the calf an ugly appearance, and make its nose sore.

After the calf is two months old, sour milk, or butter-milk may be gradually substituted for sweet milk, but must be fed warm, and not too stale.

The calves should have as much exercise as possible in the open air, but do not turn them out until an hour after feeding. If turned out immediately they will suck each other's ears, causing them to droop and freeze in cold weather.

In the summer the calves under a month old can all be allowed to run in pasture near the barn, but should be put in the stable when fed, to prevent sucking each other, and not allowed to be pestered too much by flies and mosquitoes. The best plan is to let them run out a few hours between meals mornings and afternoons.

Calves over four weeks old should be fed twice a day, and be kept off grass until they are four months old, giving them all the skim milk, clover hay, and dry oats they will eat without getting too fat.

After four months of age they can run on pasture, with an evening feed of oats or wheat bran, and hay in the stable, that they may keep familiar with stable handling.

With the above treatment, calves eight months old should be as large as ordinary yearlings, but without any signs of fatness.

After ten months of age, those of good size, showing signs of heat, should be served. They should all be served to drop their calves within two years of age. Within reason, the earlier they are got to work the better. One calf would consume about 25lbs. of flax seed meal, from about the fifteenth day to four months of age.

The above method of growing the calf up to the cow is the one recommended by the most advanced thinkers of the times, but it will not succeed unless strictly followed. We all know the temptation to "improve" on any code of instructions, and, therefore, I beg the reader to give this method a fair and honest trial, just as it calls for, and then after a full experience improve on it all he can.

SYNOPSIS OF FEEDING RULES.

First day—Calf allowed to run loose with dam.

Second to tenth day—Dam's milk warm, enough to fill calf's sides out even.

Tenth to twentieth day—Dam's milk, skim milk, flax meal, water, pasture.

Twentieth day to six weeks old— Skim milk, flax seed, water; keep off of pasture.

Six weeks old—Add clover hay, dry oats, half-an-ounce salt a day, flax meal stirred into milk, water.

Four months old—Run on pasture, or feed ensilage with oats, bran, hay, water.

FRUIT IMPORTATION.

By G. BUCHANAN.

The importations of fruit for the month of February set up an extraordinary and unenviable record. While the quantity imported was not particularly large, the amount of fruit diseased and condemned was greater than for any previous month. During the time referred to 9,900 cases of fruit were received, of which 751 cases were found to be diseased and were destroyed.

Apples and pears infested with codlin moth have been the principal cause of this unsatisfactory state of affairs, and the condition of the bulk of these fruits received at the ports during the past month is a disgrace to the shippers, who must have an extremely poor opinion of the inspection here if they think such fruit can possibly be admitted into this State. A total of 725 cases of apples and pears infested with codlin grub were condemned—408 cases of apples and 317 cases pears--out of a total importation of 3,143 cases of those fruits. When it is pointed out that of 60,146 cases of apples and pears received during 1902 only 304 cases were condemned on account of the codlin grub, the great falling off in the quality of the fruit coming forward this season will be realised. The cause of this extraordinary condition of things is suggested in the letter published in the "Notes" of this issue which recently appeared in the Melbourne *Leader*. There is certainly strong evidence in support of the contention that we must look to Tasmania for pip fruits free from the codlin grub. Last year, almost the whole of the 60,146 cases above referred to came from that State, while the fruit now being received is all from South Australia and Victoria. The difference is much to the credit of the "tight little island."

ADVICE TO SETTLERS.

By G. Buchanan.

While we have in this State an abundance of good land still available for settlement, and one of the finest markets in the world for the products the land is capable of yielding, there still appears to be considerable disinclination on the part of many people to venture on the land. There are no doubt many causes which contribute in this direction. Those who have not had experience of farming are naturally timorous of venturing in a direction totally new to them. Then there are those whose experience of farming in other parts of the world has not been successful, and who have come here with their minds made up never to again follow the plough. But amongst all those who can least be spared from the soil are the young men who determine to leave the farm to look for work in towns and the larger centres of population. In most cases these men are just the class needed to develop the country. Having spent all their lives on the farm, they know the game thoroughly, and are not liable to make the mistakes the newcomer is almost certain to fall into. It is, however, unfortunately true that while the prospects of these young men settling on the land are so promising, it does not require any very brilliant inducement to make them turn their back on the land. It is true that "distant hills look green," and to the young man who works from morning to night on the farm, the prospect of a day of eight hours labour, with opportunities for spending the evenings and spare time pleasantly, is no doubt alluring. But, after all, the object of working is not only to provide for one's present needs, but also to make provision for the future. And it will be found in the great majority of cases it is the men who stick to the land who eventually occupy the best position. The man who works for wages has always full command of his capital, and usually spends it without thinking of the future, whereas the one who labours on the land and improves it actually has the full value of his work, but in a form which precludes him from parting company with it so long as he retains possession of the land. No doubt there are many difficulties to be met and overcome before the settler is fairly out of the wood, but when the initial struggle has been gone through, and he finds himself the possessor of land cleared and fit for cultivation, together with implements and horses, he knows the greatest of his troubles are ended.

For the good of the State it is imperative that as much as possible of the valuable land now lying idle should be turned to profitable account. For not only would the cultivator of the soil benefit directly, but the increased production would be to the advantage of the general body of the consumers. Therefore every effort should be put forth that can in any way make more attractive the settlement of the land. One very strong reason why so many young men leave the farm to seek employment among larger bodies of men is that no effort is made to make home attractive. Young people naturally delight in entertainment, and the lack of this is very often the cause of driving away from the land young men who are the making of the best type of settler. In the city wise parents are ever on the alert to make the home so pleasing that their children will not be tempted to leave the pleasant fireside in search of pleasures which may not prove conducive to their moral welfare. And in the country the heads of families giving thought not only to the good of their children, but also to the advantage of the State, might well devote some attention to satisfying the craving in the youthful mind for enjoyment. The farmer who is advancing in years probably feels there is pleasure enough for him in the evening in contemplating his work, or reading the paper while he enjoys his pipe. But if the same man were to truthfully answer how much satisfaction such occupation would have given him at the age of 20, he would probably be surprised to find his ideas had changed so much. It is not of course necessary to point out how life in the country and on the farm can be brightened, and the evenings made more interesting for the young people. The amusements that serve to wile away the dull hours in towns can be equally as well practised on the farm, and if an occasional game of tennis or cricket does take up a few hours that might be otherwise employed, that time will not have been wasted if it has the effect of making farm-life pleasant. There is a good old adage which says, "All work and no play makes Jack a dull boy." The day has gone by when dull boys were considered good enough to make farmers out of. There is room on the farm for the use of the keenest intelligence, for we are apparently not yet out of the dawn of scientific cultivation, and the young man who wishes to use his brains for his own benefit and the good of humanity can find ample scope on the farm.

In another direction in which farmers' sons are often placed at a disadvantage is that not unfrequently they are not in receipt of regular wages, and have to rely on the good humour of their parent for any ready cash they may have need of. This condition of things should not be, for it prevents the young man acquiring that feeling of independence which is one of the most wholesome sensations engendered by a free life in the country. As soon as a lad becomes of use on the farm he should be in receipt of some payment for his work. It is not necessary he should receive the full amount his services are worth, for he can readily be taught that the work he does on the farm is to his ultimate advantage. But it is extremely desirable that he should have a little stock of his own to handle as he may think fit, and he should be taught from the start to use this thriftily, and put by something to be of use to him when he is old enough to start for himself. Many young men who have not been schooled in the careful handling of cash have found the sudden accession of a lump sum of ready money—such as falls to many when estates are divided—too much for their training; and only begin to realise what the money might have done if they had only been more accustomed to the careful use of it. The man who is trained from his youth to use money wisely, not wastefully, can be depended on to continue in the same course when he has learned from experience the benefit of it.

The occupation of a farmer is not only the most ancient and honourable one in the world's history, but is to this day the most useful and independent one that can be adopted. The product of many other occupations can be done without, but the commodities in which the farmer's labour results are of daily necessity, and without which the business of the universe would immediately cease. The prices of food products may fluctuate, but the use of them can never go out of fashion; therefore the farmer is not subject to the caprice of the fashionable world in regard to the commodities he has to put on the market.

BEE NOTES.

By J. SUTTON.

I have the honour to report, having inspected and given instructions to the apiarists, as under:—

Overhauling and fixing three colonies for Captain Oats, Mount's Bay Road, whose bees are doing well.

Inspected J. N. Streat's six colonies of mixed bees, all in frame hives. Moths are in evidence; close attention, however, keeps them in check and the hives fairly clean.

Mr. L. Wilson, Francis Street, Leederville, has 23 colonies mixed bees in frame hives, home-made and somewhat crude. Moths were found in some of the hives, but not yet strong enough to harm.

Mr. R. W. B. Johnston, Angove Street, North Perth, has 34 colonies, a few of which are Italian strain, and are in good order, but the black and mixed bees give trouble owing to the moths, which are being kept under by close attention; frame hives, mostly home-made.

Mr. J. Gunn, Arthur Street, West Perth, has 14 colonies of Italian bees in good order, with an abundance of honey. Mr. Gunn has about one ton of honey in stock, which is a fair sample, clear and clean, extracted.

Mr. W. Masterson, Colin Street, West Perth, has 10 colonies and four small nuclei, all Italian strain, and clean, with plenty of stores and brood; these, as well as Mr. Gunn's, are kept in an up-to-date condition.

Miss Stubs, Lord Street, Perth, had two swarms in frame hives, but the moth has taken possession and driven away all the bees.

Mrs. J. Telford, Lord Street, has three box hives of common black strain. The moth here is very bad, but recent swarming has kept them in check. Mrs. Telford intends providing frame hives, which I have promised to fit up and transfer the bees to a little later.

Mr. Amies, Coolgardie Terrace, off Lord Street, has only one colony left, his others having swarmed out for want of attention; these are Italian strain and fairly good.

Staff-captain Suttor, Salvation Army farm, Collie, has nine colonies of the Italian strain, which were found full of honey, so much so that it was no easy task to examine them. Some of the queens are only poor, and as he is anxious to have them placed in working order and fuller instructions given, I arranged to go up later and re-queen each hive and generally fix matters up with the officer who will in future take the management of the apiary. The honey in stock is very good, and in the near future should be a valuable asset and help to the homes. When next I have the opportunity of being with them, I expect to give some instructions to the boys, who take an interest in apiculture.

Mr. S. Chapman, Ferguson, has four colonies that were once good Italian strain, but now the black blood preponderates, and hence the moth is a great trouble; however, the few left have plenty of store, which is a beautiful sample of honey. Mr. and Mrs. Chapman are anxious to have their apiary put into proper order, and as soon as they can procure the needed hives and fittings I have arranged to call and put things in order and give them an object lesson in the use of the extractor.

Mr. John Fowler had 30 hives not very long ago, but the last had removed to pastures new only a few days prior to my visit, and he now has only empty boxes with a few moths only in evidence.

Mr. S. Gibbs, Upper Preston, has three boxes of mixed and black strain, which are fairly clean. Mr. Gibbs will later procure the frame hives and have the bees transferred.

Referring to the above, I find the district is an ideal one for bees and honey, and once a few got fixed and properly worked in frame hives, on modern lines, it will, I think, revive the interest, as each family I visited were glad to know the Department was taking the matter up, as had this been done some time ago this district would have given good results, as they have done well with honey even in the old boxes.

Mr. F. H. Layton, Donnybrook, has 11 colonies of good Italian stock. Here I was to give an object lesson, but being the day following the fruit show, with a ball in the evening, the attendance was only very small. However, I went through the lot and operated, giving reasons for what I did to those present, who were well satisfied with what was done. Again in the evening a lecture was to be given, but such was the state of the few that turned up we only talked bees and honey for a while, and left the lecture until a more convenient season.

Mr. Rees, Udoc, Harvey, was my next, where I found 50 colonies of Italian strain. Mr. Rees had such trouble last season with the moth that he wisely imported Italian queens, and is now busily engaged re-queening the whole; he has taken up to the present over a ton of honey. Hives are frame, Langstroth size, made on the premises; the moths are still in evidence, but the Italian bees soon make them scarce when they get in any hive.

Mrs. Smith, Udoc, bought a hive and swarm of Italians only a few months ago, which has increased to three, which are very good and strong, giving a large quantity of honey, which is very good both in colour and flavour.

Mr. Rath, and also Mr. Ash, on the Harvey estate, each had two colonies, which did very well for some time, but the moth got into them and took possession, so they have only empty hives and frames left to tell the tale; but now they can depend on getting instruction and advice, it is their intention to take the matter up, with the hope of better success in the future.

Summarising the above, which covers 21 bee-keepers, having nine boxes in the old style, which I have reason to believe will in the near future be put into frame hives, and 172 colonies in the modern frame hive, which may increase during the present season, seeing there is a good red gum flow, which seems to be pretty general, so that it would be safe to estimate an addition of 25 per cent., say 43 added to 172, representing 215 colonies.

In previous reports I have referred to the possibilities which could or may arise respecting apiculture in the South-West district, I now have the strongest conviction that the quality of the honey obtainable in the rising or hilly district will, once the extractor is fairly introduced and in general use, compare favourably with the best imported article obtained from the Eastern States.

THE WAX GRAPE.

This fine, early grape was introduced a few years ago from New South Wales by Mr. Ch. Cook, who is propagating it at his orchard near Chidlow's Well, together with some other valuable late grapes which we hope to be able to illustrate in a future issue of the *Journal.*

Of the wax grape, which is here illustrated, Mr. A. Despeissis gives the following description:—The vine is a vigorous, semi-erect grower, with light cinnamon-colour wood. The leaves are bright green, smooth on the upper and the lower surface. The bunches are carried fairly low down on the canes and are large and conical in shape, with a small or no shoulder; the berries are large, oval, loosely set, covered with a white bloom which gives them a waxy appearance. The skin is tough, the flesh firm, sweet, and of pleasant flavour. These grapes rarely have more than one pip each. In appearance they are not unlike the Muscat of Alexandria before it assumes an amber colour, or like the Raisin des Dames. Short pruning suits it. It ripens before the Muscat of Alexandria.

WEST AUSTRALIAN BEE-KEEPERS' ASSOCIATION.

MONTHLY MEETING.

The above Association met in the Museum of the Department of Agriculture on Wednesday evening, the 11th instant. Present: Messrs. J. N. Shipton (in chair), Kline, Ankers, Taylor, Sutton, Ainsley, Dickie, and Potter, hon. secretary. Communications were received from the Department of Agriculture enclosing letters from Eastern States in reply to circular *re* exhibition buildings; also copy of draft of Contagious Diseases (Bees) Act Amendment Act, with alterations as suggested by Bee-keepers' Association. Report of sub-committee was read. Sub-committee met on 25th ult. to draw up resolutions to be submitted to Producers' Conference to be held 24th March.

The following will be proposed by Mr. Sutton *in re* food adulteration—"That in the opinion of this Conference steps should be taken making it necessary that all persons responsible for the manufacture or production of foodstuffs should have attached to package of same (as a guarantee of quality) a label giving the name of article contained therein; or where such contents are made up of two or more parts, the name of each part should be stated."

Suggestions were made to alter certain paragraphs in draft of Contagious Diseases (Bees) Act Amendment Act.

A form of registration of apiaries was drawn up and forwarded to the Department of Agriculture as requested.

The secretary was asked to draw up and read at next meeting an essay on "Co-operation."

Discussion here followed on questions of interest to Bee-keepers, after which the meeting closed.

COLOUR AND TASTE OF HONEY.

COLOUR OF HONEY.

Honey varies in colour, from being clear almost as water to black. Primarily, the colour is determined by the kind of flower yielding the nectar. The light honey is obtained from flowers of the cabbage tribe, fruit bloom, white and alsike clover, and sanfoin. Various flowers give a nectar decidedly dark, but the crops noted for producing really dark honey are buckwheat, grown principally in the fens, and heather on the moors.

The soil affects the colour very appreciably. Clover honey is generally in varying shades of amber, but if grown on chalk it is almost colourless, while being of superb flavour and of remarkable density. This is understandable, because, owing to efficient drainage afforded by the chalk, the plant is never very moist.

In reference to dark-coloured honey, an authority in Lincolnshire wrote with reference to a sample: "It is gathered in the Lincolnshire fens from buckwheat grown on peaty land divided by drains, the water of which is tainted and coloured from the peaty soil; and if you saw the poor who live in those parts they look smoke-dried, I should judge from drinking the water, as well as from the smoke of the peat, which is their only fuel."

THE TASTE OF HONEY.

All honeys have more or less both flavour and aroma. The aroma may be lost by exposure, but not the flavour. The flavour may be spoilt, however, by heat. If we take a sample of honey with a scent of onion and cover it with muslin, the scent will almost wholly disappear. Aromatic herbs give a distinct flavour, as well as aroma; for instance, the famous Narbonne owes its distinctive flavour to rosemary. Wild thyme, eucalyptus, orange blossom, too, give very special flavours, samples of which I have had for many years in screw-capped or corked jars.

Crops known to produce choice honey, if grown on good soil, with a subsoil affording good drainage, will give excellent samples, providing the weather favours the secretion of nectar.

KEEPING HONEY.

Fortunately, honey is not very liable to get spoilt. Comb honey must be kept dry and free from the air, by packing it in paper and storing it in a box. Liquid—that is, run or extracted—honey, if quite ripe when taken from the combs, will keep almost indefinitely, if kept in air-tight jars or tins in a dry cupboard.

This class of honey will in time set, and so keep well. It is easily returned to a liquid condition if set in a pan of water on the fire and heated gradually. The melting-point of wax is 145 to 147 degs. Fahrenheit; and though this degree of heat must be produced to separate the honey from the wax of comb honey that has candied, a much less degree of heat applied gradually will liquefy candied honey without causing it to deteriorate in quality.

Liquefy small quantities as required, and not the bulk, as it may recrystallise, and repeated heatings would certainly be detrimental.—*Exchange.*

BEE TALK FOR BEGINNERS.

PRACTICAL SUGGESTIONS FROM AN OLD BEE-KEEPER.

"Kit Clover," in Minnesota *Farmer*:—When I had kept bees about six months I was so full of bee lore that I could have written a book on bee-keeping. At the end of six years of work, somehow, the subject had reduced itself into such a small compass that there seemed to be only a few essential points to be mentioned. That was not because I had grown so accustomed to what I know that, as is always the case with familiar work, I could not think just what to tell. I have been thinking over what some of the questions might be that I am qualified to answer. One question always is: "Can I make bee-keeping a success?"

Yes; every one can make a success of keeping bees. The requirements are honey-bearing plants in the vicinity, and then patient, careful work, promptly done. That is all. There must never be any neglect. A woman, with the help of a boy, can manage an apiary of 200 colonies with very little help, except in hive-making, and have a good deal of time left for other things besides. But one who makes so much of a business of bee-keeping as 100 or 200 colonies amounts to should have a standard bee-book to turn to in all emergencies, and should take some of the best papers. It has been proven over and over that the sale of wax and the vinegar made will pay all the expenses of such an apiary, leaving the sale of bees and honey as a clear profit.

Another question that beginners ask is: "How can I prevent the building of drone comb?"

And this requires a long answer. In the first place we will begin with the after-swarm, having a virgin queen first. These swarms know by instinct that their queen will be likely to live the season out, so no drones will be needed, and, in consequence, do not build drone comb.

But the first swarm in spring—the one that takes the old queen with it—builds drone comb, and I will tell you why, and the best way to prevent it. As it comes near swarming time the old queen deposits all her eggs. She cannot fly with the colony unless she is rid of her heavy load of eggs. Then the colony comes out. When hived it takes about five days for a new supply of eggs to mature, so that she can go to laying again.

If the colony is large, and honey is coming in, and—now here is the point—if you have put on no surplus crates for the storing of honey, as most likely you have not, there is no room in which to store honey, and the bees simply go to work and make big racks, as it were, for storing the honey. These big cells are exactly the same size as a drone cell. The first season they will be filled with honey, but ever after that they will be used for drone nests.

Now the remedy is easy to find. We will say over the conditions: If the colony is large, and the honey flow good, and your brood frames are not filled with sheets of foundation—in which case the bees do not build drone combs—you should be sure to put on crates; and if you have any sections of empty comb saved from uncapped sections of last year, be sure to put them in the centre of the super, then the bees will build good worker comb for the queen to deposit her eggs in, and they will rush up into the supers to deposit extra honey and will not stop to build big tanks in the brood frames. All bees work on certain lines, and once we get "the hang" of their ways we can tell what is best to do with them.

Bees naturally put their surplus stores into the regular small cells. They use these cells, all of one size and pattern, for storing honey, and for rearing brood. They have oceans of use for cells of this regular size, so prefer to make them.

But some instinct teaches them that some drone cells are necessary. So, if they get into a great rush, lots of nectar going to waste in the fields and nowhere to store it, they will build hurriedly a lot of big cells and store it there.

So the remedy is easy. Give the new colony plenty of room in the surplus cases as soon as hived, and there will be little or no trouble with drone cells.

If, on the other hand, the weather is cold and rainy, and possibly this first colony not very large, then it is well to keep the brood chamber compact. It may be made warm and snug by putting division boards at each side, to be taken out as the combs in the centre are built; and no supers are needed until the brood frames are filled with comb.—*Exchange.*

THE BRANDS ACT OF W.A.

By Daisy M. Bates.

We have a Brands Act in this State at the present time that affords more facilities to the cattle stealer to indulge, undetected, in his work of appropriating other people's stock than any Act that could ever be framed for the purpose of encouraging wrong-doing.

The pastoral industry being one of the mainstays of the State, the present Act is one of the most incomprehensible on the Statute Book—in that it practically encourages that most pernicious system of "cattle duffing." That is far more prevalent in the Northern portion of this State than is commonly known. Anyone looking over the present Directory of Registered Brands would be vastly amused at the variety of brands therein "sketched," for except by a special lithographic process, they are impossible of reproduction. I have often heard the "frying-pan" brand alluded to jokingly by drovers, who would facetiously observe that their "frying-pan" brand would obliterate any and every brand that I might place on my beast. It remained for me to discover that identical "frying-pan" in the pages of the "Register." There were besides, scissors, teapots with broken spouts or broken handles, coffee pots ditto, three-legged stools with one crooked leg, and hieroglyphics and symbols of such diversity, that it seemed almost impossible that these should be the registered brands of a serious community. The only approach I have ever come across resembling their extraordinary character is in the quaint and pointless carvings of the natives in the wilds of the Nor'-West. No wonder the Government Printer had to cease publishing them! for, except by special lithographic appliances, it was impossible to reproduce them. In advertisements of stolen or strayed stock, the brands had to be minutely explained, for scarcely half a dozen of them could be set in type, and as the "explanation" of some of them would occupy half a column, the result was (and is) endless inconvenience, owing to the difficulty of identification from a written description, which, in the space allotted to the advertisement, could not possibly include all the peculiarities of these "markings."

As far back as 1891 a movement was made by men who really had the interests of the Colony at heart to amend the curiously foolish system of branding them (and alas! still) obtaining. Applications were forwarded to the various other States by the Registrar General for copies of their Brands Acts, and from these, but principally from that of Queensland, which has been acknowledged everywhere as the most comprehensive Brands Act ever formed, a Bill was drafted by the Registrar and submitted to Parliament. In 1894 the Bill was brought before the House, and from the discussions on its first reading I give a few extracts:—

Mr. Lefroy said: "The Act was really necessary, as at present no information can be obtained by intending registrars of stock owing to the list of brands not being published, as, if it were, a new form of type would have to be brought into existence to furnish the curious medley of brands that are now on the register."

Hon. S. Burt said "that any system would be an improvement on the old style of branding, which consisted of such extraordinary hieroglyphics as those he had seen in the register, which were impossible to reproduce, and thus led to extreme inconvenience to the country, as owners were often unable to identify their strayed stock from the printed description alone. He recommended that, as the old stock died out with the old brands the new herd could be branded with the new brand. He said this because many of the owners objected to placing another brand on their stock in addition to the old one.".

Mr. O. Burt said "that it was in the Registry Office where the trouble was. Everybody was writing to the Registrar General about the present state of things, and he (the Registrar) said it could not go any further."

On the second reading of the Bill Mr. Lefroy seemed to change front and spoke of "vested interests in old brands," and saw no reasons to have them changed. In 1883 everybody in the Colony were obliged to register their brands, and now in 1894 they were expected to abandon those and go through the same process and expense again.

Mr. Richardson also spoke of vested interests in brands, and deprecated any change in the present system.

Mr. Cookworthy said "No demand had been made for a new Brands Bill, and he thought the Bill was in advance of the times. If people wanted a new law why did not they ask for it? He had heard of no complaints from agricultural societies or any kindred institutions representing bucolic interests, nor from stockowners about the present law."

Mr. Traylen's objection to the new system was that it would hurt the animal so much, that the branding of three letters instead of the symbols at present in use would be inhuman.

Sir John Forrest at once realised the difficulty in connection with the old hieroglyphics, and their impossibility of reproduction except by being lithographed, which led to great expense, and also the difficulty of advertising strayed stock under the circumstances. He thought that the objection of old owners to the change of brands was more sentimental than practical.

The Bill was eventually thrown out, and in the meantime the Registrar General kept pegging away at it in the hope that it would be brought up again. But session after session passed and the Bill remained *tabu*. Communications were continued with the various Registrars in the other colonies respecting the superiority of letters to figures, and the opinions of the Inspectors of Stock in each colony were received. It was found that the Queensland system of two letters and a numeral admitted of the greatest number of combinations, and was the most serviceable.

South Australia has one letter and two numerals; Victoria seems to have no special brand; and the Sydney brands are three letters and some symbols—letters and symbols placed anyhow. These brands have been taken from the Acts in vogue in those colonies in 1894. Some of them may have been amended since.

The congested state of the West Australian system of branding was getting worse and worse as the years went on, and the difficulties attendant on the tabulation of new hieroglyphics as "registered brands" increased. It became almost impossible to discover whether a new brand had not been already appropriated, as the publication of new registered brands had long been discontinued in the *Government Gazette*. The Registrar General continued to bring notice of the existing state of things before each successive session, but without effect; and here one may pause to wonder why the Registrar General of Births, Deaths, and Marriages is also charged with the control of the Brands Department, which should certainly be under the domination of either the Lands or Agricultural or Stock Departments, to either of which it more properly belongs.

Mr. Fraser found, as the result of inquiries, that a system of three letters would admit of the greatest number of combinations, and submitting this discovery to the Registrars and Inspectors in all the other Australian colonies, they agreed that it was the best of all possible systems. He then placed it before the Premier (Sir John Forrest) and the Attorney General (Hon. S. Burt), and they both acknowledged that it gave a very large choice in the matter of combinations, and was an improvement on the old style of branding, which had become unworkable.

Mr. Lefroy, Mr. Piesse, and Mr. Traylen objected to the three letters, on the grounds of disfigurement of animals with several brands of three letters, interference with existing brands, and humanity. "Three letters should not be used where two would do."

In 1901 Mr. James brought in the Bill again for discussion, but as the Bill was left until late in the session, several members moved its adjournment in order to give time to consider its various parts. Mr. J. J. Higham moved the appointment of a select committee, to be appointed by ballot, to inquire into the conditions of the Bill. Mr. Wallace approved of the appointment by ballot, justly stating that packed committees made by the movers of certain motions were contrary to principle. The committee elected were Messrs. Harper, Connor, Butcher, and Wallace, with Mr. James as mover. This committee held many sittings, and consulted many persons connected with stock, and as a result decided to recommend several alterations in the Bill as introduced to the House. It was understood that the members of this committee represented half a million of sheep and about forty thousand head of cattle. The only report that I can find is embodied in a very few words (reminding one of the mountain and the mouse), the substance of which was, that the new system of branding would greatly deteriorate the hides. There may have been a more lengthy report published, but in the print accompanying the papers, kindly submitted for my perusal, I found no other mention of the result of the sittings. However, the amended Bill upon recommittal to the Assembly in 1902 was passed by that body, and forwarded to the Legislative Council.

Mr. E. M. Clarke thought the Bill was needed, particularly in the Nor'-West, where some of the people are not altogether what they should be, and where there is great confusion as to the ownership of cattle. He had fully examined the Bill with some settlers interested, and with the alteration of a few details he was sure the measure would commend itself to the goodwill of members.

Mr. R. G. Burges urged that the Bill be altogether dropped, owing to the late stage at which such an important measure had been brought up.

Mr. C. E. Dempster had carefully looked into the Bill, and had found little to find fault with in it; but suggested bringing it under the notice of the large stock owners, who might suggest valuable amendments, and on that account it would be of interest to pastoralists to defer passing the measure until it was well known to the people.

Mr. J. G. Richardson also wished the Bill deferred. The Minister in charge said he had carefully gone through the Bill with a number of squatters, but he (Mr. Richardson) had not been asked to consider it, and he should like to have time to consider it in the interests of his constituents, many of whom had large stations in the North.

It fell to Mr. F. T. Crowder to finally eject the Bill from the Council. He said a copy of the Bill should be sent by members of the Ministry into the districts, so that it should be thoroughly discussed. (Mr. Fraser had asked in 1894 that this should be carried out by the Ministry then in power.) Telegrams from all parts asked that copies of the Bill should be sent to different Municipal Councils throughout the country districts where meetings could be held, and the Bill thoroughly discussed and reports forwarded to the Government. His (Mr. Crowder's) principal excuses for the rejection of the Bill was the payment of £1 per head for every sheep impounded, and other anomalies which he averred the Bill contained. So the same old system continues. I have been unable to ascertain whether copies of the amended Bill have been sent to the various districts. I have heard no mention of any Bill being submitted for reading and discussion in any of the pastoral centres through which I have passed. But on all sides, and from every squatter whom I have met, I have heard nothing but condemnation of the Brands Act as it now stands. They are one and all desirous of its amendment, as they say the present Act is without system of any kind. My own "next door neighbour" has an earmark that under the present Act is perfectly legal, but that quite cuts off my earmark altogether. Then, again, I understand that cutting the ear right off is not illegal. As for the variety of brands, I will instance one run—Roebuck Plains—where there are three brands in existence: H.I (Hicks and Isdaile, who owned this station years ago), S.R. (Streeter and Roe, who came after Hicks and Isdaile), and O.O.O., the present brand of Streeter. I have seen all three of these on one beast. I do not suppose that the three separate brands were put on at the same time, but if the brands were compelled to be taken over by the new owners of runs for a certain number of years, this disfigurement would be avoided.

There are at present in the Registration of Brands Department specimens of type that might be used in marking the brands when the three-letter system will eventually come into force. I believe this type cannot be "faked" from the peculiar formation of the letters, and therefore it is to be hoped that when the Bill comes again before Parliament and has passed both Houses, that these letterings will be made compulsory of adoption. The advantage of the three-letter system are manifold. They will be quite distinct from one another; they will be capable of arrangement in regular order in the Brands Directory; and they are clearly legible, and placed on certain parts of the animal, such as the neck, shoulder, or lower part of the thigh, they do not lessen the market value of the hide.

In the case of multiplicity of brands on the same run, if an annual registration fee were charged it would lead to the voluntary surrender of all other brands except the one in use by the new owner.

Earmarks are *supposed* to be registered at present, and I have seen a number of curious earmarks in the register, but I am confident that that number does not comprise all the earmarks now in existence throughout the State. The present system of earmarking has nothing to recommend it any more than the Brands Act. As I mentioned before, it lends itself to easy tampering with by unscrupulous persons. Knives and scissors should be abolished in the cutting of the ear, and pliers used instead; and instead of the "cut" ear, if tattoo marks were made on sheep and cattle they could always be identified by the owners. In the case of sheep tatoo pliers will, once their advantage is made obvious, do away entirely with the difficulties of identification. Not only that, but the sheep can be as easily and quickly marked in this way as they have been by the present system; indeed even more quickly, as it has been proved that one man can tattoo between 2,500 and 3,000 sheep in one day, and the marks will be just as legible as those done on sailors' arms, for instance.

The manner in which tattoo ear-marking is done in New South Wales is as follows:—A proper tattoo pliers is obtained, with the head set at right angles to the handle. Then a small brush, something like a nail-brush, but soft and flat on the face, is used to rub in the ink, and a piece of thin board, about the size of a playing card, is put at the back of the ear when rubbing in the ink. A sufficient quantity of lamp black and spirits of wine is made into a thin paste in some handy dish and nailed to a post and then the lamb is held as for ordinary ear-marking, the ear snapped with the pliers and the ink rubbed in with the brush; or, if the brush cannot be obtained, the ink could be made somewhat thicker and taken up on the point of the finger and rubbed into the letterings. In this way, if properly imprinted, a tattoo mark will always be legible. The same method could be followed in ear-marking cattle.

It is earnestly to be hoped, in the interests of all honest stock-owners throughout this State, that the amended Brands Bill shall be brought again before Parliament at an early date, and that it will receive better treatment than it has hitherto had. The "confusion worse confounded" of the present "blackfellow" system of branding is admitted by all those who have had a glimpse into its erratic workings to be the worst system obtaining in any civilised community, and the sooner it is changed for a better one the greater chance for the struggling young squatters, who, besides the disadvantages of distance, drought, etc., have also to contend against the sneaking cattle duffers who find the present Brands Act an excellent one for the prosecution of their nefarious practices.

The Brands Department, too, should be of sufficient importance to stand by itself, or at least in conjunction with either of the three departments already named, instead of being tacked on, as it were, to the births, deaths, and marriages division. The present Registrar General has never ceased, during the past 12 years, to urge the Government to make some change in the present Act. Year after year, as Parliament met, he has brought the matter forward, and not one of the folios which I examined in order to study the Act but has some notes and annotations which could only have been written after a close study of the better methods prevailing in all the other States. The Scotch tenacity of purpose is apparent in the Registrar's persistency in "worrying" the heads of the respective Governments over the matter, and his great desire for an amendment of the present Brands Act is not to be wondered at when one thinks of the "pots and pans and kettles and cans" that meet his eyes whenever he has occasion to consult the register: a collection of ludicrous hieroglyphics totally out of keeping with the dignity that should surround such an important part of the Government machinery as that appertaining to the pastoral interests of the State.

PLANT DISEASES.

By Richard Helms.

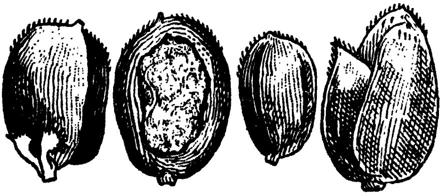
Ear-Cockle in Wheat.

Owing to the re-appearance of Ear-cockle, it is thought desirable to republish the following article, which appeared in the *Producers' Gazette* some time back :—

A few months ago some diseased ears of wheat were sent to the Department, which appeared, from the minute spots on portions of the chaff, to be attacked by a fungus. The ears were well developed, and otherwise normal in appearance, but, instead of the usually golden seeds, contained irregularly-shaped dark-coloured shrivelled grains, about $\frac{1}{8}$-inch long. On closer examination, these grains were found to be the galls formed by a nematode, a minute semi-transparent worm, that is well known to have caused considerable damage to wheat and other cereals in several parts of Europe and America, and which also occurs in the other Australian colonies.

The disease is variously known as "ear-cockle," "purples," "peppercorn," or "false ergot," and Dr. Cobb (*Agricultural Gazette* of New South Wales, vol. I., p. 173) refers to it as "gouty" wheat grains.

The nematodes by some means reach the newly-formed ear, and, by attacking the reproductive organs and ovary, greatly damage these or entirely destroy them. In consequence no seed is formed, but in its stead a gall is produced, which serves as a shelter for the young worms. When fully developed, the gall is brownish or purplish black, and very hard. Its wall is constructed of hexagonal cells, and comparatively thick, and encloses a white fibrous substance. This matter is composed of an incredible number of minute nematodes, closely coiled together, and interspersed with a little white powdery substance which is considered to be gluten.



Galls of "ear-cockle" from wheat spikelet, with portion of wall from one split off to disclose accumulation of worms. Enlarged five diameters. (After Smith.)

By crushing a gall and placing it in a watch glass or other glass vessel with about half a teaspoonful of clear water, its contents will dissolve in a milky flocculent substance, the greater part of which, when the vessel is gently shaken, or the mass spread with the point of a penknife and held over a dark surface, appears like short pieces of fine wool. These are the worms, which, in about ten minutes more, may be seen to move in a slowly undulating manner.

The number present will be found enormous. I lifted a drop of the water charged with these worms, and under the microscope counted over 500 in it. From this revelation I feel convinced that, on an average, each gall contains more than 5,000 nematodes. Such numbers prove the surprising fecundity of these minute creatures, which in the mature state reach only a length of scarcely more than $\frac{1}{8}$-inch; but astounding as their reproductive powers may be, the wonder is still surpassed by the extraordinary tenacity of life possessed by them.

Dr. Bastian described the worm under the name of *Tylenchus tritici*; Schneider named it *T. scandens*; and Needham *Anguillula tritici*.* The first name is the one generally adopted.

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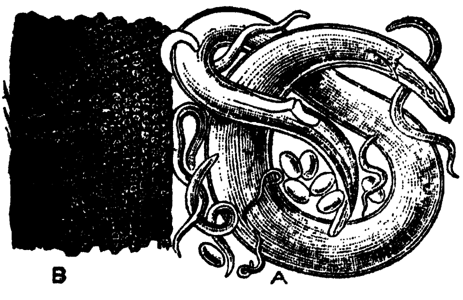
* *Tylenchus*, from the Greek of *tylos* a knot, knob, and *enchos*, spear, in allusion to the shape of the galls formed by the agency of these creatures, and the pointed prolongation possessed by them behind, known technically as "spear"; *tritici*, Latin, belonging to wheat; *scandius*, Latin, climbing; *Anguillula*, Latin, small eel, from Anguilla eel.

The life history of the creature and the method by which it reaches the ears is not definitely known. Curtis * states:—"The eggs are taken up by the sap from the infected grain which may have been planted, and hatch in the stalk as well as in the germen." This seems to me to be an untenable hypothesis, as the "ear-cockle" cannot germinate, it not being a seed, but a gall—a mere shell, containing a ball of worms and a little gluten.

Smith † says:—"Various observers have artificially infected wheat with the *Tylenchus* by placing the living nematodes taken from a gall in the furrow or cleft of a grain, and then planting the infected seeds in the soil in the usual manner. Or galls may be planted in close contiguity with healthy grain. After a brief time the nematodes will work their way through the wall of the softened and decaying galls, and come naturally in contact with the young leaves sprouting from the healthy seed. The nematodes then insert themselves between the sheaths of the leaves, gradually working their way round till they come to the innermost, where they remain till the rudiments of the future ear begin to form."

Although the wandering of the minute worm in the manner described is long and circuitous, this theory seems best to explain the creature's presence in the ear, which apparently it requires to reach in order to propagate its race, and where in affected plants it may always be found soon after the terminal shoot has begun to form.

It is uncertain whether the worms copulate on their way to the forming ear, or after attacking the sprouting inflorescences, and by their aggression have induced the adventitious growth which constitutes the gall; but it is evident that the parents die after depositing their eggs, and that the occupants of ripe galls remain in the larval stage until they are released and enabled to obtain food for their further development.



A, Portion of colony of nematodes in various stages from the egg.

B. Fragment of wall of an "ear-cockle." Enlarged 40 diameters. (After Smith.)

Unless the worm attains maturity and reproduces itself, its life may remain suspended for an indefinite period, and even when released from its covering and awakened by the application of water it may, without being destroyed, relapse into a dormant state again at the withdrawal of the moisture. "Dr. Bastian specially adverts to the tenacity of life belonging to the species found under the genus *Tylenchus*, and he attributes that vital tenacity in part to the structure of the integument of the animals. This integument is of such a nature that it enables the nematodes to resist desiccation, and prevents the evaporation of moisture through their tissues. The power of remaining in a dormant, deathlike state for a long series of years Dr. Bastian attributes to some inherent peculiarities of the animal's tissues beyond the reach of detection by optical instruments of even the highest power. The same author says it is an established fact that *Tylenchus tritici* is capable of resuming activity after remaining dormant for 27 years." *

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* *Farm Insects*, by John Curtis, F.L.S.

† *Diseases of Field and Garden Crops*, by Worthington G. Smith, F.L.S., etc., London, 1884. This valuable work was kindly lent me by D. McAlpine, Esq., the Government Pathologist of Victoria, to whom I am also obliged for other assistance. I embrace this opportunity to acknowledge my gratitude.

Even after the larvæ, being released from the gall, have been brought to activity in water they do not die when allowed to become dry again.

"For five years and eight months Mr. Brauer was able to reanimate the worms by immersion, but it required a longer period as the time lengthened, and after that they died. Other examples bred by him retained their revivescent qualities for six years and one month. . . . They may be kept alive for three months in water." †

My own experiment confirms the tenacity of life of this creature, after a severe test. The contents of a gall were animated in a little water and then placed near a window, where, for ten hours daily, they remained exposed to the blazing sun. The water dried up in less than half an hour in the shallow dish and the worms were left, thinly spread, sticking to the flat bottom of the vessel. After 18 days exposure I moistened the dish towards night, and on the following morning found the worms actively wriggling.

Considering the great fecundity of these worms and the extraordinary tenacity of life possessed by them, their destructive powers may become severely felt unless due precautions are taken against the spread of an invasion. No doubt the difficulty they have in finding a food plant and then reaching the ovaries of the cereals militates against their aggressiveness, as it is evident that by far the greater number of the nematodes must succumb after the walls of the gall have decayed, and that only a very small proportion are able to attain the goal in which to perpetuate their race. It is well that it is so, or the production of cereals would soon become impossible, for it has to be borne in mind that, in addition to wheat, rye and oats, as well as several kinds of meadow grasses, are subject to their attacks.

If infested land is allowed to remain fallow for a few years and used for grazing, it becomes free from nematodes, and this seems to be the best remedy against them; or, by alternating the crops and sowing pulses or planting potatoes, which are unsuitable food plants, the same object may also be attained. It is very probable that some natural enemy destroys the worms when they emerge from the gall, otherwise their disappearance could not be accounted for, considering their otherwise extraordinary retention of vitality.

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* Smith, *loc. cit.* † Curtis, *loc. cit.*

But too great care cannot be taken not to sow the galls with cereals. This can easily be avoided, as they are readily recognised by their dark colour; and being much smaller than most grains, except rye, they will pass through a sieve with proper meshes. All galls should be carefully gathered and burnt, and, if mixed with broken or small grain, this should be boiled before it is used for food.

From wheat, which always should be steeped to prevent fungus growth, the galls may also be separated if the "pickle" is allowed to rise above the surface of the corn and the corn be stirred. This manipulation will allow the lighter "cockles" to ascend and float on top, when they may be readily skimmed off.

Remembering the enormous number of worms a single gall contains, the destruction of every specimen cannot be too determinedly insisted upon.

In conclusion, it may not be out of place to draw attention to a noxious weed, the *Lychnis Githago*, also known as "corn-cockle," the seeds of which are black, and superficially resemble the "ear-cockle." As this weed occurs in parts of the other colonies, it may at any time find its way to Western Australia. Both the names as well as the resemblance between the gall and the seed readily lead to confusion, and although of the two the weed is considerably less objectionable than the nematode, it nevertheless would be a very undesirable introduction, and should be vigorously suppressed on its first appearance.

EARLY MATURITY IN LIVE STOCK.

The most remarkable feature in live stock husbandry in modern times is the development of early maturity in nearly all the domestic animals. Sheep and cattle are now sent to market by the British farmers that not so very many years ago would have been regarded as not half grown. So great has been this change that the old system of telling a beast's age by its teeth is no longer reliable. The development of early maturity has extended to the turf, and the result is a great increase of two-year-old racing. In an article which appeared in the *Field*, the writer says:—"The rate of progression in the forcing of cattle to maturity at early ages has been rapid and continuous for nearly a quarter of a century, and that being so, it goes without saying that by this time a very high standard of perfection has been reached." To judge by the results of the late fat stock shows in England, it would appear as if the skilful feeders of what are known as the beef breeds of cattle are somewhat embarrassed by this strong tendency to early maturity. That a steer under three years old should occasionally be exhibited that will weigh a ton shows what a marvellous advance has been made in the way of early maturity and the skilful forcing of your cattle. In the article referred to it is stated:—"From 16cwt. to 18cwt. may reasonably be considered the utmost limit for the best specimens of our pure breeds and their first crosses, and as this is reached already by a large majority of the show bullocks of the bigger breeds, it may be said that a point has been reached when a turning in some direction, or a further advance in curtailing the fattening period, is desirable." This points to reducing the age in the classes for steers in the fat stock shows, which at present are under two years, and under three years. The same writer tells us that "In the classes for crossbred shorthorn Herefords and Aberdeen Angus steers under two years of age, no animal can be considered a likely prize-winner that weighs less than 12cwt., while from 13cwt. to 15cwt. is about the usual range." That such immature animals should attain so great a weight will be regarded as a wonderful result by cattle-raisers in Australia, where the stock, with a few exceptions, are all fattened on the natural pasture of the country, and seldom go to market until they are in their fourth year. The British farmers do not deem it advisable to have their steers weigh over 17cwt., and as it has been shown conclusively that that weight can be reached comfortably by steers of the larger breeds in two years and nine months, it is highly probable that the age limit will be reduced. Whether the meat of these forced young animals is as wholesome and as nourishing as that of steers that have reached their fourth year is apparently never taken into consideration. For the feeder the question is purely one of profit; he realises that the more quickly he can force his young stock to be fit for the market the quicker he will get his return.—*Exchange.*

THE CURE FOR MOSQUITOES.

There is a widely spread belief, both amongst natives and amongst the white sojourners in Western Africa, that the presence of a certain species of plant in a room drives away mosquitoes, and, in fact, a single plant is said to be sufficient to clear a room. On his recent return from Northern Nigeria, Major J. A. Burdon, of the Cameron Highlanders, brought with him and gave to me a few leaves of this plant. These, through the kindness of Mr. H. H. W. Pearson, have been identified by the experts at Kew as belonging to *Ocimum viride*, Willd., a member of the order Labiatæ, which occurs from Senegambia southwards to Angola.

Major Burdon, who is Resident of the Nupe Province, Northern Nigeria, and Hausa Scholar of Christ's College, Cambridge, has given me the following account of the plant:—

"A fragment of what turns out to be *Ocimum viride* was given me in August last at Lokoja, Northern Nigeria, by Captain H. D. Larymore, C.M.G., R.A., Resident of the Kabba Province. Capt. Larymore's notice had been drawn to the plant by a native living in a low-lying part of the native town at Lokoja, who had told him that the natives suffered very little from the swarms of mosquitoes which existed in that part, as they protected themselves from them by the use of this plant.

"Capt. Larymore made inquiries and obtained a few specimens of the plant, which grows wild, though not very abundantly, in the neighbourhood of Lokoga. These specimens he planted in pots and boxes and kept in and about his house. The specimens I saw were about the size of a geranium.

"He informed me that the presence of one of these plants in a room undoubtedly drove the mosquitoes out, and that by placing three or four of the plants round his bed at night he was able to sleep unmolested without using a mosquito net. This is very strong testimony to the efficacy of the plant, for the house in which Capt. Larymore was living is, as I had cause to know well in former years, infested with mosquitoes."

In the fifth volume of Sir W. T. Thiselton-Dyer's "Flora of Tropical Africa," *Ocimum viride* is described as follows:—

O. viride, Willd.; Benth, in D. C. Prod. XII. 34. A perennial 3-6ft. high, with much-branched glabrous stems. Leaves distinctly petioled, oblong, acute, membranous, 3-4in. long, glabrous on both sides, or obscurely pubescent beneath. Racemes, lax, copiously panicled, 3-6in. long; rhachis finely pubescent; bracts deciduous; pedicles not very short. Calyx 1-6in. long; tube companulate; upper lobe orbicular, as long as the tube; lower teeth short. Corolla half as long again as the calyx-lobes. Stamens but

little exerted, the two upper with filaments toothed above the base.—Benth. in Hook. Niger Fl. 488; Henriques in Bolet Soc. Brot. X. 149. *O. febrifugum.* Lindl. in Bot Reg. t. 753. *O. heptodon*, P. Beauv. Fl. Owar. 11 59. t. 94.

The plant is figured on plate 753 of the ninth volume of the Botanical Register, 1823, under the name *Ocymum febrifugum*, or the "Sierra Leone Fever Plant." This work mentions that the plant is "in request at Sierra Leone for medicinal purposes," and describes the species as an "*under shrub* 3ft. high, having in a high degree the smell of common balm."

The leaves of the plant are highly glandular, and in India an allied species, *O. Basilicum*, Linn., "the common sweet basil" produces a "yellowish green volatile oil lighter than water, which, on being kept, soldifies into a crystalline camphor, isomeric with turpentine camphor." (*Gmelin's Handbook*, xiv., 359). The seeds of this species are widely used in the East as a medicine, and their properties "are said to be demulcent, stimulant, diuretic and diaphoretic." "The juice of the leaves, mixed with ginger and black pepper is given in the cold stages of intermittent fever." The leaves, like those of thyme, are used as a seasoning in cooking. Another Indian species, *O. sanctum*, Linn., the "sacred basil," is the most sacred plant in the Hindu religion, and is consequently widely cultivated.

In "Notes on the Medicinal Plants of Liberia," Mr. E. M. Holmes records that when chewed or rubbed, the leaves of *O. viride* give off a strong odour of Lemon thyme, and mentions that Dr. Roberts, of Liberia, entirely substituted the use of the plant for that of quinine in cases of fever of all kinds, giving it in the form of an infusion.

There is thus a good deal of evidence that *O. viride* is a plant of considerable curative value, especially in cases of fever, but the question that interests a large number of people in West Africa is, whether it is equally efficacious as a preventative. Does it really repel the mosquito which acts as the intermediary in conveying the malarial hæmatozoon from man to man? Further experiment on this point is needed, but there is at least some indication that in this easily cultivated plant man has another weapon with which to fight malaria.—A. E. SHIPLEY, Christ's College, Cambridge.—*Nature*, Jan. 1.

SCAB OR ITCH IN CATTLE.

Scab or itch, sometimes called mange, of cattle is caused by a minute mite *Psoroptes communis* var. *bovis* that lives upon the surface of the skin and burrows in the epidermis. It does not attack other animals than cattle, although scab of sheep is caused by a similar parasite.

SYMPTOMS.—Scab or itch does not trouble cattle to a noticeable extent during the grazing season, when they are doing well on grass. Close observation is required to detect the disease in a bunch of cattle, but as soon as they are placed on dry feed, and cold weather sets in, the disease appears, and, if the cattle are not doing well, in an aggravated form. Scab usually attacks young cattle, calves, yearlings, and two-year-olds, but may attack cattle of any age if they are "out of condition." The first symptom noticed is an intense itching of the skin, usually in the region of the neck or shoulders. The animals lick themselves, dig at the skin with their teeth or horns, rub against posts or barbed wire, often tearing the skin until it bleeds. The disease gradually spreads along the back, sides, and outside of legs, but does not attack the inside of the legs, thighs, or skin of the abdomen. In the early stages the coat looks rough; there is a scurvy condition of the skin; the scurf becomes mixed with a gummy exudate and forms crusts in the hair, sometimes one-half inch thick; the hair then comes off or is rubbed off the badly affected area, leaving bald patches of thick, calloused, wrinkled skin. These patches often show first and prominently on the top of the neck, as if the neck had been calloused from wearing a yoke. After the hair comes off the parasites leave that part and the hair grows in again. Animals suffering from scab present a dejected and debilitated appearance and fall away rapidly in flesh; they do not eat well, and spend a great deal of time and energy in scratching themselves.

Scab spreads quite rapidly through a bunch of cattle, especially if the cattle are not doing well. Six or eight weeks after the disease first makes its appearance is sufficient time to disseminate the disease pretty thoroughly. Thrifty, vigorous animals resist infection longer than others, and recover more quickly under treatment than debilitated animals. The disease is spread by direct contact with infected posts, feed-racks, walls, etc., against which infected animals have rubbed. The mites will live from a week to 10 days in protected places, but are killed quickly by direct sunlight.

By scraping off some of the scabs, and especially the epidermis, from the infected part and placing the material in a clean, dry glass bottle, in a few hours minute white specks, barely visible to the naked eye, can be observed crawling on the inner surface of the bottle. By the aid of a hand lens these mites can be easily recognised.

Treatment.—As soon as the disease is discovered in a bunch of cattle the affected animals should be isolated, and the infected quarters and rubbing posts disinfected with a five per cent. solution of carbolic acid. Affected animals should be well fed and cared for and be salted with a mixture of one pound of flowers of sulphur mixed with ten pounds of common salt. To cure the disease, external treatment must be applied. If a large number of cattle are affected, the most satisfactory method is to build a dipping vat, through which the animals must swim in the dip used to destroy the mites. The vat should be 40 feet long. Efficient remedies used for external application are some of the coal tar products, such as Car-sul, Chloro-naphtholeum, Zenoleum, Creolin, etc.; these are used in two and one-half per cent. solution with water; that is, one part of the medicine to 40 parts of water. A very effective and cheap dip is composed of lime and sulphur in the following proportions:—

Flowers of sulphur	21 pounds.
Unslacked lime	16¾ „
Water	100 gallons.

Slake the lime to form a thick paste, sift in the flowers of sulphur and stir well; put this mixture in a kettle with 25 or 30 gallons of water and boil for 30 minutes at least; two hours is better. The chocolate-looking mass is allowed to settle, the clear liquid is drawn off, and water enough is added to make 100 gallons. All dips are more effective when used warm, from 100° to 110° F. Animals should be kept in the dip about two minutes, or until the scabs are thoroughly saturated. A second dipping in two weeks will kill any mites that may have hatched from the egg after the first dipping. One dipping, if thoroughly done, is usually sufficient, however, to free a bunch of cattle from this disease.

Where only a few animals are affected, hand treatment can be resorted to, but it should be thoroughly done. The remedies can be applied with scrubbing brushes, clothes, or sponges, and all scabs and crusts should be thoroughly saturated. The remedy should be applied warm, as in dipping. In dipping or hand treating, warm, sunny days should be selected for treating the animals.

Cattle scab is rather common in some parts of the Great Plains region, and stockmen in purchasing cattle should be cautious about getting animals affected with this disease. While the death loss is usually not high, the loss of flesh, general deterioration, and annoyance resulting from this disease is considerable. Cattle that have been treated should be carefully watched for reappearance of the disease, especially when taken off of grass the next season.—*Press Bulletin No. 18* of the Veterinary Department, Experiment Station, Kansas State Agricultural College.

ANNUAL SHOWS.

The following shows have taken place since our last publication. We are indebted to the Press for copies of the report:—

COOGEE AGRICULTURAL SOCIETY, SIXTH ANNUAL SHOW.

The sixth annual show of the Coogee Agricultural Society was held on February 18th, when the following prizes were awarded:—

CLASS A.—VEGETABLES.

Best collection: Bray and Pearse, 1. Beetroot: Bray and Pearse, 1 and 2. Beans, dwarf: J. B. Mell and Son 1; A. Anderson, 2. Beans, runners: A. Anderson 1; W. H. Allen, 2. Carrots: A. Anderson, 1 and 2. Cabbages: Bray and Pearse, 1 and 2. Cucumbers: Bray and Pearce, 1; J. Lyons, 2. Marrows: Mrs. Postans, 1; A. Anderson, 2. Onions, brown: W. H. Allen, 1 and 2. Potatoes, best 28lb.: Bray and Pearce, 1 and 2. Best collection potatoes: Bray and Pearce, 1. Largest Pie-melon: J. Cooke, 1; Mrs. C. Trebly, 2. Pumpkins, not less than three varieties: C. Trebly, 1; A. Anderson, 2. Pumpkins, bugle: C. Trebly, 1 and 2. Pumpkins, round: A. Anderson, 2nd (no first). Peas: J. Mortimer, 1. Parsnips: A. Anderson, 1 and 2. Rhubarb: S. Dixon, 1 and 2. Radishes: Bray and Pearce, 1 and 2. Turnips: Bray and Pearce, 1 and 2. Salads: Bray and Pearce 1.

CLASS B.—FRUITS.

Best collection: A. Anderson, 1; W. J. Bryant, 2. Best collection apples: J. B. Mell and Son, 1; W. J. Bryant, 2. Dessert apples: J. B. Mell and Son, 1; G. Meeks, 2. Kitchen apples: Mrs. Postans, 1; W. J. Bryant, 2. Figs: J. Mortimer, 1; Mrs. Postans, 2. Best collection grapes: C. Trebly, 1; Mrs. Christie, 2. Best bunch grapes: Mrs. C. Trebly, 1 and 2. Lemons: A. Anderson, 1 and 2. Best collection of melons: A. Anderson, 1 and 2. Water-melons: A. Anderson, 1 and 2. Rock-melons: W. J. Bryant, 1; Mrs. C. Trebly, 2. Nectarines: Mrs. C. Trebly, 1; A. Anderson, 2. Pears: J. Mortimer, 1 and 2. Peaches (best collection): Mrs. C. Trebly, 1; A. Anderson 2. Twelve peaches: R. Gordon, 1. Plums: W. J. Bryant, 1. Pomegranates: W. H. Allen, 1 and 2. Quinces: J. Mortimer, 1. Tomatoes (best collection): W. J. Mell. Tomatoes, red: S. Dixon, 1 and 2. Passion fruit: Spearwood Poultry Farm, 1; A. Anderson, 2.

CLASS C.—CUT FLOWERS.

Best collection: Miss Allen, 1; Mrs. Mell, 2. Table bouquet: Mrs. Mell, 1. Ladies' dress bouquet: Mrs. Mell, 1. Gent's buttonhole bouquet: Miss Christie, 1; Mrs. Christie, 2. Best collection pot plants: Mrs. Dowse, 1.

CLASS E.—POULTRY.

Hamburgs: Spearwood Poultry Farm, 1. Leghorns (white): Spearwood Poultry Farm,* 1. Leghorns (brown): Mrs. Fox, 1; Spearwood Poultry Farm, 2. Langshans: Spearwood Poultry Farm, 1. Plymouth Rocks: Mrs. Sanmiguel, 1. Minorcas: J. Odgers, 1; Spearwood Poultry Farm, 2. Wyandottes (silver): Mrs. Fox, 1; E. W. Young, 2. Wyandottes (golden): Mrs. Fox, 1 and 2. Game: J. Miller, 1; Spearwood Poultry Farm, 2. Aylesbury ducks: Mrs. Tozer, 2. Pekin ducks: E. W. Young, 1 and 2. Indian runner ducks: Spearwood Poultry Farm, 1; J. Miller, 2. Geese: G. Beard, 1. Best collection: Spearwood Poultry Farm, 1. Orpingtons: Mrs. Fox, 1 and 2.

CLASS F.—PIGS.

Boar (over 12 months): Bray and Pearce, 1. Boar (under 12 months): Bray and Pearce, 1. Porker: N. Thorsager, 1.

CLASS G.—SUNDRIES.

Best collection pastry: Miss Christie. Home-made bread: Mrs. Glasson, 1 and 2. Butter: Mrs. Glasson, 1; Mrs. Norish, 2. Cake: Mrs. Dowse, 1. Miss Anderson, 2. Scones: Mrs. Mell, 1; Mrs. T. Thomas, 2. Honey: R. Taylor, 1; Bray and Pearce, 2. Pickles: Miss Allen, 1. Jam: Mrs Mell, 1; Mrs. A. Anderson, 2. Sauce: Mrs. Thomas, 1; Mrs. Christie, 2. Preserved fruit: Mrs. Dowse, 1. Needlework for children under 14 years: Marie Reynardson, 1; May Anderson, 1. Fancy needlework: Mrs. Mell, 1. Hens' eggs: Spearwood Poultry Farm, 1; Mrs. Mell, 2. Chaff (wheaten): R. Semple, 1; E. Lewington, 2. Chaff (oaten): R. Semple, 1; E. Lewington, 2.

JARRAHDALE AND SERPENTINE AGRICULTURAL SOCIETY'S SHOW.

The above show was held at Mundijong on the 21st of February, when the following prizes were awarded:—

FRUIT.

Best collection and best variety of fruit: R. Cohen, H. J. Butcher. Collection apples: N. Watkins. Six dessert apples: W. Matthews, N. Watkins. Six culinary apples: J. Keenan, W. Matthews. Six dessert pears: E. H. Absolon, N. Watkins. Six culinary pears: N. Watkins, E. H. Absolon. Twelve dessert peaches: W. Atkins, Mrs. K. Green. Twelve culinary peaches: H. Laslett, E. H. Absolon. Collection of grapes: H. J. Butcher, B. Turner. Bunch table grapes: Mrs. K. Green, B. Turner. Plums: E. H. Absolon, 1 and 2. Passion fruit: E. H. Absolon, 1 and 2. Quinces: Watkins, W. Mathews. Figs: H. J. Butcher, R. Cowen. Lemons: R. Cowen, E. H. Absolon. Rock-melons: D. Gaffin, R. Cowen. Water-melons: R. Cowen, 1 and 2. Pie-melon: J. Murray, F. and G. Cockram.

VEGETABLES.

Best collection: D. Gaffin. Cabbages: D. Gaffin, 1 and 2. Beetroot: D. Gaffin, 1 and 2. Carrots: D. Gaffin, R. Tonkin. Turnips: D. Gaffin. Tomatoes: D. Nairne, D. Gaffin. French beans: P. Curo, D. Gaffin. Green peas: D. Gaffin, 1 and 2. Onions: D. Gaffin, R. Tonkin. Rhubarb: D. Gaffin, J. Keenan. Collection of potatoes: D. Gaffin. Seven pounds potatoes: P. Curo, E. Hanrahan. Pumpkins (collection): J. Murray, R. Cowen. Largest pumpkin: P. Turner, R. Cowen. Bugle pumpkin: J. Murray. Vegetable Marrows: D. Gaffin, 1 and 2. Cucumbers: D. Gaffin.

FARM AND DAIRY PRODUCE.

Bundle of green fodder: P. Curo, E. H. Absolon. Sheaf wheaten hay: W. Nairne, F. and G. Cockram. Sheaf oaten hay: W. Nairne, D. Gaffin. Bag wheaten chaff: W. Nairne, R. Cowen. Bag oaten chaff: W. Nairne,

R. Cowen. Mangolds: F. and G. Cockram, J. Keenan. Hen eggs: Mrs. Rudd, F. and G. Cockram. Ham: D. Gaffin. Roll of bacon: D. Gaffin, 2. Collection green fodder: D. Gaffin.

POULTRY.

Minorca cock: E. D Cockram, A. Cockram. Minorca hen: Roy Potts, G. Potts. Pair of geese: Mrs. McEwen, E. D. Cockram. Pair of turkeys: E. D. Cockram.

INDUSTRIAL.

Loaf bread: Miss N. Keenan, Mrs. McEwen. Plate scones: Mrs. Matthews, Miss W. Selkirk. Fruit cake: Miss E. Cockram, Miss Jackson. Swiss roll: Miss E. Cockram, Mrs. McEwan. Honey: Mr. Rance, Miss E. Cockram. Home-made jam: Miss M. Baldwin, Miss Jackson. Marmalade: Mrs. McEwan. Bottled fruits: Miss Jackson. Fancy needle work: Mrs. Rudd, Miss Knapp. Pinafores (by girls under 17): Miss E. Cockram, Miss A. Baldwin. Dressed doll: Miss Olive Baldwin. Map of W. A.: H. Snook, Miss A. Hanrahan; Copy Book (by child 13 or under): H. Snook. Copy book (by child 10 years or under): L. Matthews.

FLOWERS.

Collection of cut flowers: Miss E. Cockram, D. Gaffin. Foliage Plants: Miss C. Cockram, 2. Pot plants: Miss Norah Szeczinski. Petunia: Miss E. Cockram. Packing contests (best packed case of apples): Geo. G. Watkins, R. Cowan.

JUMPING COMPETITION.

Hunters: The Grafter (A. Cockram), Mundijong, 1; Nimrod (A. E. Thomas), Pinjarrah, 2. Ponies: Silverlock (F. Cockram), 1; Florodora (A. Szeczinski), 2.

PIG GUESSING COMPETITION.

The Minister for Lands, 1; The Premier, 2.

KELMSCOTT AND ARMADALE AGRICULTURAL SOCIETY'S SHOW.

This show was held at Armadale on the same day as the previous one, the following being the list of prizes:—

FRUIT.

Collection: T. James, G. F. Marsh. Collection stone fruits: T. James. Collection apples: J. Butcher, T. James. Jonathan apples: F. Atherton, 1 and 2. Dun seedling: T. James, G. F. Marsh. Cleopatra: A. V. Cross, G. F. Marsh. Nectarines: J. W. King. Freestone peaches: F. Atherton, T. James. Almonds: W. J. King. Bartlett pears: G. F. Marsh, H. D. Cullen. Cooking pears: G. F. Marsh. T. James. Eating pears: R. Dowell, Mrs. Saw. Plums: T. James. Japanese plums. F. Atherton, J. Butcher. Passion fruit: J. Steffin, A. E. Kimber. Quinces: A. Butcher, T. James. Strawberries: A. E. Kimber, 1 and 2. Blackberries: Mrs. Saw, A. V. Cross. Mulberries: R. Dowell.

GRAPES AND WINES.

Grapes: F. Atherton, Gordon. Muscatel grapes: Mrs. Ullmann, J. F. McNeal. Ladies' finger: J. F. McNeal. White ness: J. Butcher, 1 and 2. Doradillos: Gordon, H. D. Cullen. Waltham cross: J, Butcher, 1 and 2. Any other variety: Gordon, 2. Heaviest bunch; J. Butcher, Gordon. Wine grapes—Shiraz: Gordon. Malbeck: F. Atherton, Gordon. Burgundy: F. Atherton, T. James. Fontainebleau: F. Atherton, T. James. Grenache: J. F. McNeal, Gordon. Carbenet: Gordon. Wines:—dry red: Gordon, T. James. Sweet red: Gordon, F. Atherton. Sweet white: Gordon. Dry white: F. Atherton, 2. Claret: Gordon.

VEGETABLES.

Butter beans: R. Dowell. French beans: R. Dowell, B. V. Cross. Cucumbers: Batt, A. E. King. Vegetable marrow: Albert Butcher, A. E. Kimber. Mangolds: Mrs. Ullmann, J. Butcher. Water-melons: A. Butcher, 1 and 2. Rock-melon: R. Batt, 1 and 2. Onions: Mrs. Ullmann, T. James. Potatoes: J. Butcher, Batt. Pumpkin (other than bugle): Mrs. Cullen, B. V. Cross. Parsnips: Mr. Batt, B. V. Cross. Rhubarb: B. V. Cross, A. E. Kimber. Tomatoes: Mr. Batt. Collection water and rock-melons: A. Butcher. Collection of pumpkins and marrows: B. V. Cross, Mrs. Saw.

FLOWERS:

Bunch garden flowers: Miss Olive Batt, Mrs. R. Dowell. Lady's spray: Miss O. Batt, 1 and 2. Hand bouquet: Miss O. Batt, 2. Bridal bouquet: Miss O. Batt. Gent's buttonholes, Miss O. Batt, 1 and 2. Three roses: Miss O. Batt. Rose, six varieties: Miss O. Batt. Zinnias: Miss O. Batt. Carnations: Mrs. W. Butcher. Dahlias: Miss O. Batt.

SUNDRIES.

Home-made bread: Mrs. Watkinson, Mrs. Saw. Scones: Mrs. King, Miss Mabel Saw. Fruit cake: Mrs. Ullman, 2. Tomato sauce: Mrs. Saw, Mrs. W. Butcher. White shirt: Mrs. Watkinson, Mrs. Cullen.

JAMS.

Collection: Mrs. Saw, Mrs H. C. Saw. Marmalade; Mrs. W. Butcher, Mrs. Saw. Apricot: Mrs. Cullen, Mrs. J. W. King. Plum: Mrs. Saw, Mrs. Cullen. Fig: Mrs. Cullen, Mrs. J. W. King. Grape: Mrs. Cullen, Mrs. J. W. King. Gooseberry: Mrs. A. E. Kimber and Mrs. Jay. Strawberry: Mrs. Cullen, Mrs. Saw. Mulberry: Mrs. Saw, Mrs. J. W. King.

MURRAY HORTICULTURAL SOCIETY'S SHOW.

The twenty-fifth annual show of the above society was held at Pinjarra on Saturday, 28th February, when the following prizes were awarded:—

FRUIT.

Collection: Mrs. Salter, 1; Mrs. Fawcett, 2. Dessert apples: Norrie and Watkins, 1; Mrs. Salter, 2. Culinary apples: Norie and Watkins, 1; J. McKay, 2. Dessert pears: Norie and Watkins, 1 and 2. Culinary pears: J. McKay, 1; M. Brown, 2. Peaches: J. McKay, 1; Norie and Watkins, 2. Quinces: Norie and Watkins, 1 and 2. Nectarines: Mrs. Salter, 1; Mrs. H.

M. Dallis, 2. Plums: J. McKay, 1; E. McLarty, 2. Passion fruit: M. Cox, 1; Norie and Watkins, 2. Figs: Mrs. A. Thomas, 1; Keith Paterson, 2. Mulberries: J. McKay, 1; Mrs. Fawcett, 2. Bananas: J. McKay, 2. Rhubarb: Mrs. Gaffin, 1. Collection grapes: Mrs. Green, 1; Mrs. McLarty, 2. Wine grapes: R. Green, 1; Mrs. Salter, 2. Table grapes, J. Lane, 1. Mrs. W. Green, 2. Raisin grapes: Mr. Brown, 1; Mr. Cox, 2. Water-melons: J. McKay, 1; V. Adam, 2. Greatest variety fruit: J. McKay, 1. Best packed case: Norrie and Watkins, 1 and 2:

VEGETABLES.

Collection: Mrs. Salter, 1; Mrs. Gaffin, 2. Beetroot: Mrs. Gaffin, 1; Potatoes: Elfred and Drattle, 1 and 2; Mr. Butterworth, 3. Pumpkins: Mrs. Salter, 1; J. McKay, 2. Vegetable marrow: Mrs. Gaffin, 1; Mrs. Salter, 2. Tomatoes: Mr. Butterworth, 1; Elford and Drattle, 2. French beans: Mrs. Gaffin, 1 and 2. Cucumbers: Mrs. Salter, 1; Victor Adam, 2. Onions: Mrs. Salter, 1; Mrs. Braidwood 2. Chilies: Mrs. Salter, 2. Eschalots: Langlois Green, 1; Mrs. Braidwood, 2. Carrots: Mr. Ogilvie, 1. Parsnips: Victor Adam, 2. Cabbage: Mrs. Gaffin, 1; V. Adam, 2. New vegetable: Mr. Deetle.

FLOWERS AND POT PLANTS.

Pot plants (collection): Mrs. Fawcett, 1; Mrs. W. Green, 2. Amaranthus: Mrs. Cuthbert, 1. Coleus: Mrs. Fawcett, 1 and 2. Asters: A. Anderson, 1. Cockscombs: Miss Beecham, 1. Foliage: Mrs. Fawcett, 1 and 2. Single specimens—Amaranthus: Mrs. Wigley, 1. Begonia: Miss Pollard, 2. Coleus: Mrs. W. Green. Geranium: Mrs. J. Corpe, jun., 2. Cut flowers (collection): Mary Ede, 1; Miss M. A. McLarty, 2. Rare bloom; Miss M. A. McLarty, 1. Pressed wildflowers: Mrs. Wigley, 1; Miss C. Adam, 2. Hand bouquet: Miss Cooper, 1. Floral design: Mrs. Wigley, 2. Lady's spray: Miss M. A. McLarty, 1; Decima Alderson, 2. Buttonholes: Miss D. Alderson, 1; Miss Fewcett, 2.

WINE.

White: Mrs. Salter, 1; E. Fawcett, 2. Red: Mrs. McAter, 1; E. McLarty, 2.

INDUSTRIAL.

Collection dried fruits: Miss Alderson, 1. Raisins: Mrs. Salter, 1; Mrs. Fawcett, 2. Candied fruit: Mrs. Fawcett, 1; F. Alderson, 2. Pickles: Mrs. C. Farmer, 1. Jams: Miss Alderson, 1; Mrs. Kilian, 2; Mrs. Thomas, 3. Jelly: Miss Alderson, 1 and 2. Marmalade: Miss Alderson, 1; Mrs. Dallis, 2. Honey: Mrs. Salter, 1; Mrs. Fawcett, 2. Tomato sauce: Mrs. Cuthbert, 1; Miss M. Alderson, 2. Vinegar: Mrs. Salter, 1; Mrs. McAter, 2. Bread: Miss C. Adam, 1; Mrs. Farmer, 2. Wheat; E. McLarty, 1; Miss L. Sutton, 2.

SOUTH-WEST CENTRAL AGRICULTURAL AND HORTICULTURAL SOCIETY'S ANNUAL SHOW.

The second annual show of the above society was held on their new show ground, at Donnybrook, on the 4th inst., it proving a great improvement on the previous year. The following is the prize list:—

HORSES.

Judge: Mr. W. B. Mitchell. Steward: Mr. J. Egan.

Thoroughbred stallion: H. S. Brockman. Thoroughbred brood mare: M. Locke. Roadster stallion: H. Wills & Co. Draught stallion: J. Trigwell. Draught mare: J. Trigwell. Colt (under three years): Wills & Co. Filly (under three years): M. Thomson. Gentleman's hack (bred in S.W. district): G. Baxter. Lady's hack: C. Reynolds. Foal by Billy: A. C. Mitchell. Foal by Mentor: F. G. Fowler. Foal by Orphan: V. C. Mitchell. Buggy and pair: W. Harrison. Single turn-out: M. Thomson. Hunters: H. S. Brockman. Ponies (1·32 and under): A. Fowler. High jump: H. S. Brockman. Mounted infantry turn-out and equipment (judge, Dr. Eliot; steward, Mr. J. Egan): J. Trigwell, 1; W. H. Smith, 2. Best team of not less than four horses (driven without reins on grounds): H. S. Brockman. Draught foal (under 12 months): J. S. Bentley. Blood foal (under 12 months): V. C. Mitchell.

CATTLE.

Judge: Mr. E. McLarty. Steward: Mr. T. Miller.

Bull for beef: M. Thomson. Dairy bull: H. G. Hinde. Dairy cow: M. Thomson, 1; H. G. Hinde, 2. Cow for breeding for beef: M. Thomson. Dairy cow: H. G. Hinde. Pen of beef or dairy heifers: M. Thomson, 1; H. G. Hinde, 2.

SHEEP.

Judge: Mr. G. Lowrie. Steward: Mr. J. M. Whistler.

Fine wool ram: J. Trigwell. Ewe: W. W. Trigwell, 1; J. Trigwell, 2. Long wool ram: J. L. Bentley. Ewe: H. S. Brockman. Strong wool Shropshire ram: J. L. Bentley. Pen of lambs: A. Wood, 1; W. W. Trigwell, 2. Pen of wethers: W. W. Trigwell.

PIGS.

Judge: Mr. T. Walters. Steward: Mr. J. M. Whistler.

Pen of suckers (not less than five): H. Lyons.

FARM PRODUCE.

Judge: Mr. F. Johnston. Steward: Mr. V. C. Mitchell.

Bag of chaff (wheaten): W. W. Trigwell, 1; J. L. Bentley, 2. Bag of chaff (oaten): J. L. Bentley, 1 and 2. Sheaf of hay (wheat): J. L. Bentley. Sheaf of hay (oaten): J. L. Bentley. Sheaf of maize (green): V. C. Mitchell. Bag of potatoes: J. W. Hackett, 1, C. R. Trigwell, 2. Sack of onions: E. Gardiner, jun. Bushel of wheat: W. J. Ecclestone, 1; W. W. Trigwell, 2. Bushel of oats: V. C. Mitchell. Bushel of barley: J. Maguire, 1; V. C. Mitchell, 2. Bushel of rye: W. J. Ecclestone. Bushel of peas: V. C. Mitchell, 1; H. S. Brockman, 2. Cow peas: W. J. Ecclestone. Maize: W. Smith, jun. Cattle pumpkins: V. C. Mitchell. Mangolds: Silas Gardiner Green fodder: W. Smith, jun. Ensilage: J. J. Lyons.

DAIRY PRODUCE.

Judge: Mr. E. J. Hadlow. Steward: Mr. W. J. Ecclestone.

Butter: H. S. Brockman, 1; H. G. Hinde, 2. Hen eggs: Mrs. J. Moore, sen.

FRUIT.

Judge: Mr. Hawter. Stewards: Messrs. Back and Ecclestone.

Apples: Parke and Lillburne, 1; T. Walters, 2. Dessert apples (three varieties): J. W. Hackett, 1; J. J. Lyons, 2. One variety: James Udy, 1; T. Walters, 2. Cooking apples (three varieties): James Udy, 1; C. H. Gibbons, 2. Cooking apples (one variety): C. H. Gibbons, 1; Geo. Trigwell, 2. Dessert pears (three varieties): Parke and Lillburne, 1; T. Walters, 2. One variety: V. C. Mitchell, 1; J. W. Hackett, 2. Baking pears: J. Udy, 1; W. Woods, 2. Quinces: G. Sharp, 1; T. Walters, 2. Yellow flesh peaches: W. W. Trigwell, 1; J. Udy, 2. White flesh peaches: W. J. Ecclestone. Japanese plums: T. Walters, 1, W. J. Ecclestone, 2. English plums: E. Martin, 1; J. W. Hackett, 2. Lemons: J. M. Whistler, 1; J. W. Hackett, 2. Figs: W. J. Ecclestone, 1; Silas Gardiner, 2. White table grapes: J. M. Whistler, 1; J. M. Whistler, 2. Black table grapes: W. J. Ecclestone, 1; J. M. Whistler, 2. Wine grapes: W. J. Ecclestone, 1; J. Trigwell, 2. Passion fruit: C. H. Klotzbach, 1; A. Bendall, 2. Walnuts: T. Chapman, 1. Almonds: J. Maguire. Water-melon: G. Sharp. Preserving-melon: J. W. Hackett, V. C. Mitchell. Single variety tomato: W. H. Smith, sen., 1; J. W. Hackett, 2. Collection of fruit (six varieties): Parke and Lillburne. Six varieties export apples: J. W. Hackett. Best dish of new fruits: Parke and Lillburne.

VEGETABLE' AND GARDEN PRODUCE.

Judge: Mr. F. Johnson. Steward: Mr. W Hurst.

Collection vegetables: J. W. Hackett, 1; C. Gibbons, 2. Cabbage (white): C. Gibbons, 1; W. H. Smith, jun., 2. Carrots (long red):, J. W. Hackett. Carrots (short horn). J. W. Hackett. Parsnips: D. Gardiner. Beet (long red): J. W. Hackett. Beet (turnip-rooted): L B. Miller. Turnips (white): C. Gibbons. Turnips (yellow): J. W. Hackett. Swede: J. W. Hackett. Radish (long red or white): C. Gibbons. Radish (turnip-rooted): J. W. Hackett. Leeks: J. W. Hackett. Celery (white), C. Gibbons. Celery (pink): C. Gibbons. Beans (French): C. Gibbons. Green peas: J. W. Hackett. Table maize: W. H. Smith, jun. Horse radish: C. Gibbons. Cucumbers: W. W Trigwell, 1; J. W. Hackett, 2. Vegetable marrows: C. Gibbons, 1; S. Gardiner, 2. Custard marrows: V. C. Mitchell. Custard squash: V. C. Mitchell. Pumpkin (bugle or trombone): W. J. Ecclestone. Pumpkin (other variety). V. C. Mitchell, 1; G. Trigwell, 2. Potatoes (single variety): J. W. Hackett, 1; E. F. Wright, 2. Potatoes (three varieties): J. W. Hackett, 1; E. F. Wright, 2. Onions: W. W. Trigwell, 1; E. Gardiner, jun., 2. Rhubarb: J. W. Hackett, 1 and 2. Largest and heaviest potato (sound) in Show: C. R. Trigwell.

POULTRY.

Judge: Mr. F. W. Camilleri. Steward: Mr. J. B. Miller.

Malay game (cock and hen): J Maguire, 1; H. Lyons, 2. Leghorn (brown, cock and hen): V. C. Mitchell, 2. Leghorn (white): A. Trigwell, 2. Nondescript (cock and hen): W. Wood, 1 and 2. Turkeys (American bronzewing, cock and hen): A. Bendall, 1. Geese (pair): J. Trigwell, 1; H. J. Bradshaw, 2. Ducks (Aylesbury): W. Carpenter, 1; H. S. Brockman, 2. Pekin, H. S. Brockman, 1; F. J. Fowler, 2. Indian runner: H. S. Brockman. Nondescript: S. Gardiner, 1; H. S. Brockman, 2.

APICULTURE.

Judge: Mr. Sutton. Steward: Mr. A. Hurst.

Observatory hive with bees at work): F. H. Layton. Comb honey: F. H. Layton, 1 and 2.

WINE.

Judge: Mr. Hawter. Stewards: Messrs. Bach and Ecclestone.

Red wine: J. Trigwell.

FLOWERS.

Judge: Mr. Hawter. Stewards: Messrs. Bach and Ecclestone.

Collection pot plants: Mr. Bendall.

IMPLEMENTS AND MACHINERY.

Judges: Committee and Mr. G. Campbell.

E. J. Hadlow.

VEHICLES.

Judges: Messrs. T. Creer, W. Trigwell, G. Campbell.

Buggy: W. T. Delaney. Waggonette: W. T. Delaney.

HORSESHOES.

C. Lambert.

DRIED FRUITS.

Judge: Mr. Hawter. Stewards: Messrs. Bach and Ecclestone.

Currants: F. H. Layton. Apricots: F. H. Layton. Peaches: F. H. Layton.

INDUSTRIAL.

Judge: Mr. J. Parke.

Collection sauces: W. J. Ecclestone.

DOMESTIC.

Judges: Ladies' Committee.

Butter (fancy only): A. Trigwell (commended). Butter (rolls or fancy): Mrs. T. Miller, 1; Mrs. Armstrong, 2. Scones: Miss E. Murphy. Pastry: Mrs. Gates, 2. Sponge cake: Mrs. Hadlow, 2. Currant cake: Mrs. Gibbons. Ginger nuts: Miss E. Murphy, 2. Victoria sandwich: Mrs. Gibbons, 1; Miss E. Murphy, 2. Seed cake: Mrs. Gibbons. Any new kind of cookery: Mrs. Gibbons, 1; Mrs. Gates, 2 Bottled fruits: H. J. Bradshaw. Jams: Agnes Trigwell, 1; F. G. Fowler, 2; Mrs. Moore, commended. Marmalade: Mrs. Sharpe, 1; Mrs. E. Tuxford, 2. Jellies: Mrs. Gates, 1; Mrs. J. Moore, sen., 2. Pickles and sauces. Miss A. Trigwell, 1; Mrs. Harrison, 2. Chutney: Mrs. Harrison, 1; Miss A. Trigwell, 2. Damper (male competitors only): W. W. Trigwell, 1; V. C. Mitchell, 2.

MISCELLANEOUS.

Judges: Ladies' Committee.

Ironed white shirt and collar: Mrs. Murphy. Hand-sewn quilt: Mrs. Denning. Tea cosey: Mrs. Nicholls. Cushion: Mrs. A. B. Moore, 1; Mrs. J. B. Anderson, 2. Fancy knitting: Miss A. O'Brien, 1; Miss Getty, 2. Drawn thread work: Mrs. Gibbs, 1; Mrs. Sharpe, 2. Shadow work: Mrs. Gibbs, 1; Mrs. Johnston, 2. Painting (nature): Miss Harrison. Painting (copy): Mrs. Gibbs, 1; Miss C. Ecclestone, 2.

SCHOOL WORK.

Judges: Ladies' Committee.

Writing (small hand), under 12 years: Veronica Brown, 1. Writing, over 12 and under 16: Isabel Hamilton, 1; Nellie Hunter, 2; Written Copy Book, under 10: Reuben Chapman 1, Ethel Smith 2; 10 to 12, Veronica Brown 1, Mabel Trigwell 2; 12 to 16, Isabel Hamilton 1, E. Campbell 2. Homework (book), under 11: Alma Fowler 1, Queenie O'Brien 2; 11 to 16, C. Hunter 1, Alice O'Brien 2. Brushwork (book), under 12: Elsie Hannan 1, Alma Fowler 2; 12 to 16, Isabel Hamilton 1, C. Hunter 2. Map of Australia, under 12: Martin Brown 1, S. Klotzbach 2. Any map, 12 to 16: P. Miller, 1: Isabel Hamilton, 2. Collection of vegetables and fruit modelled in clay: H. McCombe, 1; H. Campbell, 2. Freehand drawing, under 12: P. Miller 1, Amy Lyon 2; 12 to 16, Ethel Smith 1, Mabel Trigwell 2. Woodwork: C. Hunter, 1; Bernard Patroni, 2.

NEEDLEWORK.

Judges: Ladies' Committee.

Garment, Gathering, Buttonholes, Herring-boning (12 and under): V. Murphy, 2. Garment, patching, print, calico, and flannel; buttonholes, gusset, darning, hedge-tear, and stocking-web (over 12 and under 16); Isabel Hamilton, 1; Nellie Hunter 2. Best dressed doll (under 12): V. Murphy, 1; Veronica Brown, 2. Fancy work (under 12): Ida Gibbs, 1: Mary Jeffery, 2. Standards I. and II.—Bag and pillow-slip, and specimen of sewing and fell: Lily Gardiner, 1; Eva Wood, 2. Standard III.—Garment, sew, fell, hem, and gather: Minnie Mulholland, 1; Mary Wood, 2. Freehand drawing (over 12): C. Hunter, 1; Isabel Hamilton, 2. Cane weaving: H. J. Bradshaw, 1.

NEW BOOKS.

The following new books have been added to the Library of the Department, and are available to the public:—

"Rocks, Rock-Weathering, and Soils," Merrill.
"Veterinary Science."
"American Cattle Doctor."
"Feeds and Feeding," Henry.
"The Farmers' Veterinary Adviser," Law.
"Diseases of the Horse," C. Hawner.
"Animal Castration," Liautard.
"Feeding Animals," Stewart.
"Angora Goats."
"Animal Breeding," Shaw.
"Land Drainage," Manly Miles.
"Drainage for Profit and Health," Waring.
"Tile Drainage," W. I. Chamberlain.
"Irrigation Farming," Wilcox.
"Prize Gardening."
"Fruit, Harvesting, Storing, and Marketing," Waugh.

"Fumigation Methods," Johnson.
"The Pruning Book," Bailey.
"The New Rhubarb Culture," Morse.
"Cabbages, Cauliflower, etc.," Allen.
"Tobacco Leaf," Killebrew and Myrick.
"Mushrooms," Falconer.
"Sugar Beet Seed," Ware.
"A.B.C. of Potato Culture," T. B. Terry and A. I. Root.
"Tomato Culture," A. I. Root.
"The Peanut Plant," B. W. Jones.
"Sweet Potato Culture," Fitz.
"Indian Corn Culture," C. S. Plumb.
"Manual of Flax Culture."
"Broom-Corn and Brooms."
"First Principles of Agriculture," E. B. Voorhees.
"Farm Appliances."
"Farm Conveniences."
"The Bommer Method of Making Manure," G. Bommer.
"Manures, How to Make and Use Them," F. W. Semper.
"Practical Fruitgrower," S. T. Maynard.
"American Dairying," H. B. Gurler.
"Outlines of Dairy Bacteriology," Russell.
"A.B.C. in Cheese-making," J. H. Monard.
"Testing Milk and its Products," Farrington and Woll.
"A.B.C. of Bee Culture."
"The Honey-Bee," Langstroth.
"Quinby's New Beekeeping," L. C. Root.
"Duck Culture," Jas. Rankin.
"Poultry Craft."
"Low-Cost Poultry Houses."
"Capons for Profit," T. Greiner.
"Turkeys, and How to Grow Them."
"The Diseases of Poultry," D. E. Salmon.
"The New Egg Farm," H. H. Stoddard.
"The Dairy Calf."

GARDEN NOTES FOR APRIL.

By Percy G. Wicken.

This month should be a busy one in the garden, and also on the farm. By the time these notes are published we shall, no doubt, have had several good falls of rain, which will put the ground in good order for the planting of seed and putting out of young plants which have been raised in seed beds.

The ground should, if possible, be dug and manured with farmyard manure before the rain comes. It is then in the best condition to derive the greatest benefit from the rainfall. It is not advisable to work the ground when it is very wet, as this causes the soil to cake and become hard. Care should be taken not to plant the seeds too deep in the ground, as many of the smaller seeds, when planted, deep, have not sufficient strength to force their way to the surface. As a general rule the depth to plant seeds may be taken as four times their own thickness. Large seeds require to be planted deeper than small ones. Where the land is likely to become wet in the winter provision should be made to drain off the surplus water. Plants do not like stagnant water, and will not thrive where the roots are immersed in it. The best way to drain land is by underground drains, and, now that agricultural drain pipes are being made in the State, these pipe drains should be constructed at a reasonable expense, and when properly laid are almost everlasting. Well drained land, besides being dry and warm in the winter, is also moister during the dry weather, and crops flourish to much greater perfection it it. After the first rains a crop of weeds will soon appear in the garden. These must be kept hoed down as they appear, and the ground kept well stirred by the horse or hand hoe.

ASPARAGUS.—Although this plant should not be planted until spring, a bed should be prepared as described in the last issue of the *Journal.*

BROAD BEANS.—This is the best time for sowing the main crop. It will do well in almost any kind of soil, although it prefers a clayey soil. The rows should be 3 feet to 4 feet apart, and seeds should be 6 inches apart in the rows. It is better to plant a few rows every week instead of planting a lot at one time, as this keeps up a succession of plants coming into bearing.

BEET (SILVER).—If planted in a seed bed, the young plants may be put out in the open. If sown in the open, the drills will require thinning and weeding. This plant makes a lot of leaves, and the application of some liquid manure will soon force it along.

BORECOLE OR KALE.—If not already planted out, a few rows of this plant should be put in. It is useful as a vegetable if the supply is short, and is very useful for stock.

BRUSSEL SPROUTS are a very good vegetable, and grow in clusters on a stalk like a number of small cabbages. They are a welcome addition to the table, and should succeed in all the cooler districts. Any plants already raised may be put out, and seed put in for future use. They should be planted and treated the same as cabbages.

CABBAGES.—Plant out as large an area as possible either for home use or for market, and plant seed for future use. In planting out from seed bed only use healthy, well-formed plants; all spindly and weak plants should be discarded. In lifting the plants from the seed bed care should be taken that the roots are not injured, and plant out carefully, putting the roots as nearly as possible in the same position as in the seed bed.

CAULIFLOWER.—Plant out plants from seed bed, and treat same as cabbages; they require to be supplied with plenty of liquid manure.

Carrots.—This is a good time to sow carrots extensively. Sow seed about half an inch deep in drills one foot apart. Sow thinly along the drill, and thin out when plants are about two inches above the ground.

Leek.—Sow as much seed as you require. When the seedlings have attained the height of about six inches or a little more, they may be planted out in heavily-manured ground in shallow trenches, so that light manure can be applied.

Lettuce.—Sow a quantity of seed, and plant out from seed bed any plants that are large enough.

Onion.—Sow a plentiful supply of this plant. The ground requires to be well manured with well-rotted stable manure. Onions prefer a sandy loam soil, well drained. As soon as the young plants are up they require weeding. The surface soil should be worked very fine. Seed may be either sown in beds, or in the drills in the field. The drills should be about 15 inches apart, and the plants thinned to four inches in the drills.

Parsnip.—A few rows may be sown. The ground requires to be worked to a depth of two feet, as this is a deep-rooted plant.

Peas.—Sow a plentiful supply of this vegetable. They should be sown in drills from two to three feet apart, according as to whether they are dwarf or running varieties. They require plenty of lime, and also potash and phosphoric acid manures.

Turnips.—Early varieties will now be getting a fair size, and will require thinning out and weeding. A further supply of seed may be planted for a later crop.

Farm.—The principal operations on the farm during this month will be ploughing, and sowing the wheat crop. Those who have fallow land will be able to start sowing operations as soon as rain falls. It is an advantage in most districts to get the wheat in as early as possible; it is the early sown crop that generally gives the best results. All seed should be pickled before sowing, as a preventative against smut. It should be dipped in a solution of bluestone—1lb. of bluestone to 5 gallons of water. After being dipped the seed should be dried before being put in the seed-drill. From three-quarters to one bushel of seed per acre is the best quantity to sow, but poor land, where the wheat does not stool out well, will require more seed than rich land; also, land that is wet and cold will require more than drier land, as a greater percentage will fail to germinate.

THE CLIMATE OF WESTERN AUSTRALIA DURING FEBRUARY, 1903.

The barometer was above the average throughout the State.

The temperature was fairly normal on the whole. In the neighbourhood of Perth it was slightly below, and on the Coolgardie goldfields it was above the average for previous years.

The rainfall was about the same as for previous years throughout the goldfields and in the North-West districts, but elsewhere it was lighter than usual, although some places in the tropics received a very heavy downpour. In the South-West division scarcely a drop fell.

The only interesting meteorological feature of the month was the passage of a tropical disturbance, which put in an appearance off the North-West coast near Condon on the 18th, and worked down to the neighbourhood of Onslow on the 20th, giving stormy weather all along the coast. The rain travelled across to the goldfields, as it usually does, but owing to the development of high pressure on the South coast the track of the "low" was not very well marked. Rain, however, was fairly general throughout the Murchison on the 20th, and on the Coolgardie goldfields from the 22nd to the 25th, leaving cool weather there for the remainder of the month.

Through the courtesy of the Government Astronomers in South Australia, Victoria, and New South Wales we are now enabled to compare our weather in Perth with that in Adelaide, Melbourne, and Sydney, and this will doubtless be of interest to those who have been accustomed to the climates of the Eastern States.

The Climate of Western Australia during February, 1903.

	Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
						February, 1903.					* Average for previous Years.					
		Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan 1.
NORTH-WEST AND NORTH COAST:	Wyndham ...	29·830	29·768	29·953	29·631	95·7	78·9	87·3	102·4	78·0	98·3	79·1	120·0	64·0	491	3315
	Derby	29·836	29·778	30·002	29·577	93·9	77·2	85·6	100·5	71·2	93·6	77·0	105·0	68·0	870	1217
	Broome ...	29·842	29·777	30·002	29·572	92·3	79·9	86·1	100·0	72·0	91·0	77·7	101·5	67·0	299	382
	Condon ...	29·817	29·775	30·003	29·637	94·5	78·0	86·2	104·8	73·8	93·6	77·3	113·0	70·0	225	225
	Cossack ...	29·801	29·752	30·000	29·477	97·1	77·8	87·4	108·3	73·5	97·1	78·2	115·0	64·0	451	451
	Onslow ...	29·820	29·799	30·010	29·410	93·0	75·0	84·0	104·0	70·0	97·2	74·0	123·0	60·0	246	246
	Carnarvon ...	29·842	29·812	30·981	29·602	91·7	73·2	82·4	...	67·0	90·5	71·0	114·0	57·0	16	16
	Hamelin Pool...	29·847	29·808	30·012	29·659	97·1	71·5	84·3	108·6	62·0	97·3	69·7	115·4	58·0	Nil	Nil
	Geraldton ...	29·910	29·899	30·090	29·790	89·0	68·0	78·5	109·0	58·0	85·4	65·0	110·8	51·0	43	43
INLAND:	Hall's Creek ...	...	...	...	...	...	...	...	...	...	98·5	74·4	109·0	48·0	...	...
	Marble Bar ...	...	...	...	...	105·0	79·0	92·0	117·0	70·0	...	...	...	...	377	426
	Nullagine ...	29·794	...	30·918	29·613	102·1	75·9	89·0	111·0	72·0	100·0	75·1	113·5	66·0	155	189
	Peak Hill ...	29·815	29·775	30·990	29·640	98·0	75·0	86·5	104·0	64·0	97.3	74·6	111·8	60·4	31	34
	Wiluna ...	29·870	...	30·132	29·559	96·2	70·0	83·1	107·5	62·0	...	...	...	...	62	69
	Cue	29·884	29·808	30·101	29·636	98·4	71·7	85·0	106·8	59·2	99·0	72·5	113·8	57·0	21	25
	Yalgoo ...	29·870	29·820	30·090	29·650	93·0	69·0	81·0	105·0	58·0	97·6	69·9	116·2	56·0	76	76
	Lawlers ...	29·956	29·832	30·171	29·534	93·3	69·9	81·6	105·2	62·1	94·8	71·3	113·9	51·8	248	265
	Laverton ...	29·964	...	30·254	29·537	91·6	66·2	78·9	106·9	55·0	...	...	...	...	113	135
	Menzies ...	29·945	29·882	30·260	29·580	90·0	65·0	77·5	104·0	54·0	92·1	66·8	112·8	47·8	217	397
	Kalgoorlie ...	29·984	29·918	30·349	29·548	89·6	62·4	76·0	103·7	51·8	90·6	64·3	115·0	48·2	19	25
	Coolgardie ...	29·997	29·908	30·320	29·549	89·3	60·8	75·0	106·6	51·0	90·6	62·7	114·3	47·4	38	62
	Southern Cross	29·965	29·892	30·300	29·700	91·8	61·6	76·7	108·7	52·5	92·2	62·4	112·0	46·6	70	70
	Walebing ...	...	...	...	...	90·3	62·4	76·4	105·2	51·0	...	...	...	...	207	208
	Northam ...	...	...	...	...	91·5	61·2	76·4	107·0	50·5	...	...	...	...	451	457
	York	29·990	29·936	30·310	29·660	91·4	60·8	76·1	108·5	54·2	90·4	62·8	115·6	45·8	35	36
	Guildford ...	...	...	...	...	90·4	62·3	76·4	107·6	51·0	...	...	...	...	Nil	11

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during February, 1903—*continued.*

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					February, 1903.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast:															
Perth Gardens ...	29·994	29·916	30·285	29·748	88·9	64·3	76·6	104·5	52·0	88·7	63·0	113·8	49·0	Nil	2
Perth Observatory	30·000	29·948	30·287	29·743	86·4	64·6	75·5	103·5	55·3	84·4	63·3	106·8	48·1	Nil	2
Fremantle ...	30·016	29·944	30·307	29·790	83·1	65·3	74·2	101·2	57·5	82·6	64·1	106·0	48·5	Nil	8
Rottnest ...	29·998	29·904	30·273	29·757	79·8	65·6	72·7	100·2	59·2	81·3	63·6	102·6	52·0	Nil	2
Mandurah ...	...	...	...	...	87·1	62·3	74·7	101·0	48·6	...	...	...	...	Nil	17
Wandering ...	...	...	...	...	87·8	55·9	71·8	105·0	46·2	...	..	...	...	Nil	9
Collie	...	...	...	...	85·8	51·7	68·8	100·2	39·8	...	...	...	...	Nil	23
Donnybrook ...	...	...	...	...	87·1	56·1	71·6	102·0	40·3	...	...	...	...	Nil	3
Bunbury ...	30·030	29·978	30·330	29·750	83·0	57·0	70·0	96·0	44·0	81·6	58·9	101·5	42·0	Nil	6
Busselton ...	...	...	...	...	81·6	53·9	67·8	96·0	45·0	...	...	...	...	Nil	10
Bridgetown ...	...	...	...	...	85·4	49·6	67·5	101·0	37·0	...	...	...	...	Nil	8
Karridale ...	30·050	29·006	30·350	29·780	77·5	56·7	67·1	98·0	47·0	76·8	57·1	105·5	41·1	3	44
Cape Leeuwin ...	30·040	29·970	30·340	29·750	74·4	62·6	68·5	97·5	57·1	73·5	62·6	103·8	54·8	Nil	21
Katanning ...	30·025	29·963	30·350	29·740	85·0	54·0	69·5	105·0	49·0	84·7	55·1	109·0	37·9	Nil	11
Albany	30·097	29·045	30·381	29·726	73·1	57·4	65·2	91·8	44·0	71·6	59·6	100·3	41·0	2	26
Breaksea... ...	30·100	29·002	30·390	29·720	70·0	61·0	65·5	80·0	52·0	70·2	60·5	81·5	50·0	6	30
Esperance ...	30·070	29·022	30·360	29·630	78·2	59·1	68·7	99·8	49·4	77·6	60·2	113·0	42·2	32	49
Balladonia ...	30·007	...	30·292	29·498	85·3	55·2	70·2	103·2	44·6	...	...	...	...	19	39
Eyre	30·050	29·997	30·434	29·680	77·0	60·7	68·8	94·8	43·0	78·8	61·5	110·0	42·0	11	18
INTER-STATE.															
Sydney	29·965	29·977	30·190	29·650	81·0	66·0	73·5	98·0	59·0	77·1	64·8	101·0	49·3	102	...
Melbourne	29·930	29·886	30·181	29·373	76·3	56·0	66·2	104·4	42·7	...	...	109·0	40·3	136	...
Adelaide	...	29·979	...	...	...	...	...	...	...	86·2	62·0	113·6	47·4	...	...
Perth	30·000	29·948	30·287	29·743	86·4	64·6	75·5	103·5	55·3	84·4	63·3	106·8	48·1	Nil	...

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory, Perth,
11th March, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for January, 1903 (completed as far as possible), and for February, 1903 (principally from Telegraphic Reports).

Stations.	January.		February.		Stations.	January.		February.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.		No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:					**North-West**—*cont.*				
Wyndham	2824	15	491	13	Coongon	80	2	...	...
6-Mile	2638	14	...	...	Warrawagine	102	3	...	...
The Stud Station	...	...	...	...	Bamboo Creek	103	3	180	6
Carlton	...	...	...	..	Marble Bar	49	3	377	8
Rosewood Downs	...	...	...	...	Warrawoona	230	2	337	7
Argyle Downs	...	...	...	...	Corunna Downs	37	3	...	...
Lisadell	...	...	...	...	Nullagine	Nil	...	155	...
Turkey Creek	1476	17	1033	16	Yandicoogina	...	...	...	...
Plympton, St. Mary	...	...	...	...	Kerdiadary	...	...	...	...
Koojubrin	...	...	...	...	Roy Hill	...	...	...	...
Hall's Creek	1697	13	...	...	Mosquito Creek	Nil	...	...	...
Flora Valley	...	...	...	...	Mulga Downs	...	...	...	...
Ruby Plains	...	...	...	...	Woodstock	...	...	...	...
Denison Downs	725	...	...	...	Mt. Florence	59	2	...	...
					Tambrey	...	...	...	...
					Millstream	60	1		...
West Kimberley:					Yandyarra	...	...	...	...
Obagama	...	...	...	...	Mallina	Nil	...	...	...
Beagle Bay	...	...	...	...	Whim Creek	33	1	546	...
Derby	347	8	870	12	Cooyapooya	Nil	...	...	...
Yeeda	...	...	...	...	Woodbrooke	10	1	...	...
Liveringa	...	...	...	...	Croydon	16	3	...	...
Mt. Anderson	...	...	...	...	Balla Balla	Nil	...	555	...
Leopold Downs	...	...	...	...	Roebourne	Nil	...	409	5
Fitzroy Crossing	794	13	814	13	Cossack	Nil	...	451	4
Fitzroy (C. Blythe)	...	...	...	...	Fortescue	Nil	...	381	...
Quanbun	...	...	...	...	Mardie	Nil	...	...	...
Nookanbah	...	...	...	...	Mt. Stewart	91	2	...	...
Broome	83	1	299	...	Yarraloola	26	2	...	...
Roebuck Downs	222	4	...	...	Chinginarra	50	1	...	...
Thangoo	...	...	...	...	Onslow	Nil	...	246	6
La Grange Bay	46	4	228	8	Peedamullah	...	...	...	...
					Red Hill	...	...	...	...
					Mt. Mortimer	206	2	...	...
North-West:					Wogoola	...	...	...	...
Wallal	5	1	192	6	Nanutarra	...	...	...	...
Condon	Nil	...	225	3	Yanrey	52	...	155	...
De Grey River	...	...	...	...	Point Cloates	Nil	...	...	...
Port Hedland	Nil	...	209	4					
Boodarie	...	...	...	...					
Yule River	...	...	...	...	**Gascoyne:**				
Warralong	18	1	...	...	Winning Pool	97	2	162	5
Muccan	90	2	...	...	Towara	...	...	...	...
Ettrick	7	1	...	...	Ullawarra	...	...	...	...
Mulgie	Nil	...	...	...	Maroonah	...	...	...	...
Eel Creek	89	...	269	...	Gifford Creek	...	...	...	...
Pilbarra	42	3	326	5	Bangemall	76	2	...	...

STATIONS.	JANUARY.		FEBRUARY.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Mt. Augustus	...	...	...	...
Minnie Creek	...	...	...	...
Yanyeareddy	40	1	...	...
Williambury	...	...	...	...
Wandagee	...	...	...	...
Bernier Island	...	...	...	...
Boolathana	Nil	...	...	...
Carnarvon	Nil	...	16	2
Cooralya	...	...	...	...
Doorawarrah	...	...	...	...
Mungarra	15	1	...	...
Clifton Downs	Nil	...	...	...
Dairy Creek	...	...	...	...
Upper Clifton Downs	15	3	...	...
Errivilla	...	...	...	...
Dirk Hartog Island	Nil	...	...	...
Sharks Bay	Nil	...	19	...
Kararang	...	...	...	...
Meedo	...	...	...	...
Tamala	...	...	...	...
Wooramel	Nil	...	Nil	...
Hamelin Pool	Nil	...	Nil	...
Byro	3	1	...	...
Yarra Yarra	17	2	...	...
Berringarra	10	1	...	...
Mt. Gould	...	...	...	...
Wandary	Nil	...	...	...
Peak Hill	3	1	31	4
Horseshoe	71	1	33	5
Mt. Frazer	22	2	71	2
Abbotts	4	1	87	3
Meekatharra	...	...	56	2
Belele	...	...	...	...
Mileura	11	1	...	...
Milly Milly	Nil	...	...	...
Manfred	8	3	...	...
New Forest	...	...	...	...
Woogorong	8	1	...	...
Billabalong	...	...	...	...
Wooleane	Nil	...	...	...
Murgoo	Nil	...	29	2
Meeka	44	1	9	2
Mt. Wittenoom	Nil	...	...	...
Nannine	6	1	27	2
Star of the East	Nil	...	31	2
Annean	5	1	...	...
Tuckanarra	27	2	23	1

STATIONS.	JANUARY.		FEBRUARY.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Coodardy	Nil	...	Nil	...
Cue	4	2	21	3
Day Dawn	5	1	6	2
Lake Austin	Nil	...	22	3
Lennonville	4	1	288	6
Mt. Magnet	5	1	203	5
Wurracoothara	2	1	...	...
Challa	Nil	...	88	3
Youeragabbie	Nil	...	9	1
Murrum	Nil	...	...	...
Burnerbinmah	Nil	...	2	1
Barnong	...	...	66	4
Yalgoo	Nil	...	76	3
Gabyon	Nil	...	22	1
Gullewa	Nil	...	16	2
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	Nil	...	Nil	...
Mt. View	Nil	...	...	...
Mumby	Nil	...	24	2
Yuin	...	...	...	...
Northampton	Nil	...	15	1
Mt. Erin	Nil	...	104	3
Oakabella	...	...	...	...
Narra Tarra	...	...	...	...
Tibradden	Nil	...	58	2
Sand Springs	Nil	...	...	...
Mullewa	Nil	...	16	3
Kockatea	Nil	...	24	2
Bootenal	...	...	...	...
Geraldton	Nil	...	43	4
Greenough	Nil	...	20	...
Dongara	Nil	...	39	1
Dongara (Pearse)	Nil	...	36	1
Strawberry	Nil	...	33	1
Mingenew	6	1	10	2
Mingah	4	1	34	1
Rothesay	Nil	...	50	3
Field's Find	...	...	...	...
Carnamah	Nil	...	109	4
Watheroo	1	1	190	5
Dandaragan	5	1	104	5
Moora	Nil	...	181	5
Yatheroo	...	...	...	...
Walebing	1	1	207	5
New Norcia	Nil	...	70	5

RAINFALL—*continued.*

Stations.	January.		February.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	Nil	...	12	2
Belvoir	Nil	...	Nil	...
Mundaring	6	2	Nil	...
Guildford	11	3	Nil	...
Kalbyamba	...	...	...	...
Canning W't'r'w'ks	7	2	Nil	...
Perth Gardens	2	1	Nil	...
Perth Observatory	2	1	Nil	...
Subiaco	2	1	Nil	...
Claremont	2	1	Nil	...
Fremantle	8	3	Nil	...
Rottnest	2	1	Nil	...
Armadale	15	1	Nil	...
Rockingham	25	2	Nil	...
Canning River	...	...	...	...
Jarrahdale	34	3	Nil	...
Mandurah	17	1	Nil	...
Pinjarra	Nil	...	Nil	...
Yarloop	10	2	Nil	...
Harvey	14	2	Nil	...
South-West, Central Part (Inland):				
Hatherley	Nil	...	74	4
Momberkine	Nil	...	...	...
Monglin	Nil	...	23	4
Newcastle	Nil	...	2	1
Eumalga	Nil	...	30	2
Northam	Nil	...	45	1
Grass Valley	Nil	...	66	1
Meckering	Nil	...	91	2
Cunderdin	...	...	...	...
Codg-Codgen	Nil	...	89	5
Jarragin	30	1	158	5
Doongin	Nil	...	146	3
Cuttening	Nil	...	...	...
Whitehaven	Nil	...	28	3
Sunset Hills	Nil	...	3	1
Cobham	Nil	...	19	2
York	1	1	35	1
Beverley	Nil	...	Nil	...
Barrington	Nil	...	Nil	...
Stock Hill	2	1	Nil	...
Sunning Hill	Nil	...	...	...
Wandering	9	1	Nil	...
South-West—*contd.*				
Pingelly	Nil	...	Nil	...
Marradong	9	1	Nil	...
Bannister	4	1	Nil	...
Narrogin	Nil	...	Nil	...
Wickepin	...	...	Nil	...
Gillimaning	6	2	Nil	...
Bunking	Nil	...	Nil	...
Bullock Hills	2	1	...	...
South-West Division (Southern Part):				
Bunbury	6	2	Nil	...
Collie	23	3	Nil	...
Salvation Army Settlement	1	1	Nil	...
Glen Mervyn	20	2	Nil	...
Dardanup	Nil	...	Nil	...
Donnybrook	3	1	Nil	...
Boyanup	26	2	Nil	...
Ferndale	...	...	...	...
Busselton	10	3	Nil	...
Lower Blackwood	Nil	...	Nil	...
Karridale	41	6	3	1
Cape Leeuwin	21	7	Nil	...
Biddellia	31	3	6	2
The Warren	63	6	...	...
Lake Muir	4	1	1	1
Mordalup	7	3	3	3
Deeside	11	1	Nil	...
Riverside	14	2	...	...
Balbarup	19	4	Nil	...
Wilgarup	13	2	Nil	...
Mandalup	21	3	Nil	...
Bridgetown	8	3	Nil	...
Greenbushes	Nil	...	Nil	...
Greenfields	12	1	Nil	...
Glenorchy	...	...	...	...
Williams	3	2	Nil	...
Arthur	4	1	Nil	...
Darkan	4	1	Nil	...
Wagin	1	1	Nil	...
Glencoe	Nil	...	Nil	...
Dyliabing	1	1	Nil	...
Katanning	11	1	Nil	...
Kojonup	16	1	Nil	...
Broomehill	13	2	Nil	...
Sunnyside	14	3	Nil	...
Woodyarrup	2	1	Nil	...

RAINFALL—*continued.*

STATIONS.	JANUARY.		FEBRUARY.		STATIONS.	JANUARY.		FEBRUARY.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.		No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST—*contd.*					EASTERN—*contd.*				
Blackwattle	Nil	...	...	...	Coolgardie	24	3	38	3
Mt. Barker	30	5	3	1	Burbanks P.O.	26	2	22	3
Kendenup	2	1	Nil	...	Burbanks Birthday Gift	22	1	...	...
St. Werburgh's	25	4	4	2					
Forest Hill	21	3	6	2	Woolubar	...	...	...	...
Denmark	37	2	32	3	Widgiemooltha	12	2	46	2
Grasmere	47	6	10	4	50-Mile Tank	Nil	...	22	2
Albany	24	5	2	2	Waterdale	14	1	33	2
Point King	25	2	5	1	Norseman	4	1	25	2
Breaksea	24	9	6	1	Bulla Bulling	Nil	...	25	3
Wattle Hill	..	...	31	3	Woolgangie	...	...	...	...
Cape Riche	12	3	...	...	Boorabbin	Nil	...	83	3
Pallinup	4	1	Nil	...	Karalee	Nil	...	85	1
Bremer Bay	4	1	1	1	Yellowdine	Nil	...	102	2
Jarramongup	5	1	...	...	Southern Cross	Nil	...	70	1
					Mt. Jackson	Nil	...	140	4
EASTERN DIVISION:					Bodallin	Nil	...	82	1
Lake Way	7	2	62	8	Burracoppin	15	1	77	2
Gum Creek	1	1	...	...	Kellerberrin	Nil	...	54	3
Mt. Sir Samuel	15	2	142	3	Mangowine	4	1	...	...
Lawlers	17	3	248	7	Wattoning	Nil	...	...	...
Leinster G.M.	8	2	194	7					
Lake Darlôt	Nil	...	162	6	EUCLA DIVISION:				
Mt. Leonora	6	2	125	5	Ravensthorpe	10	1	4	1
Mt. Malcolm	Nil	...	106	4	Coconarup	13	3	Nil	...
Mt. Morgans	30	1	136	4	Hopetoun	9	1	Nil	...
Burtville	Nil	...	117	3	Fanny's Cove	Nil	...	...	...
Laverton	22	1	113	3	Park Farm	10	2	41	1
Murrin Murrin	21	2	110	3	Esperance	17	4	32	2
The Granites	2	1	70	4	Gibson's Soak	7	2	7	2
Tampa	7	1	55	3	30-Mile Condenser	5	1	6	2
Kookynie	11	1	167	3	Swan Lagoon	6	2	...	...
Niagara	11	2	151	4	Grass Patch	2	1	...	...
Yerilla	6	2	78	2	Myrup	19	2	32	1
Edjudina	Nil	...	124	4	Lynburn	9	1	35	1
Menzies	180	2	217	5	Boyatup	8	2	...	...
Mulline	10	1	215	4	Point Malcolm	2	1	29	2
Waverley	Nil	...	179	3	Israelite Bay	1	1	33	1
Goongarrie	4	1	107	3	Frazer Range	...	...	...	...
Mulwarrie	11	2	106	4	Balladonia	20	3	19	1
Kurawa	Nil	...	60	4	Southern Hills	8	1	...	...
Kurnalpi	1	1	136	3	Eyre	7	1	11	1
Bulong	6	1	31	2	Madura	15	1	...	...
Kanowna	5	1	74	3	Mundrabillia	...	...	...	...
Kalgoorlie	6	1	19	3	Eucla	11	2	9	1

The Observatory, Perth,
11th March, 1903.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during February, 1903.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of														
					Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomeloes.	Pines.	All other fruits.
Fremantle ...	8956	7547	1409	1409	311	...	196	...	...	1315	14	959	5	1421	3311	...	2	3	10
Albany	926	852	74	74	285	...	...	..	.	195	15	73	...	164	105	...	...	...	15
Geraldton ...	3	3	..	...	...	..	.	...	..	..	...	...	..	..	...	...	3	...	...
Esperance .	15	15	...	...	5		..	...	...	...	...	...	...	2	6	...	...	...	2
Total ...	9900	8417	1483	1483	601	...	196	...	...	1510	29	1032	5	1587	3422	...	5	3	27

Department of Agriculture,
9th March, 1903.

Return of Fruit Trees and Plants imported into Western Australia during February, 1903.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.														
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	5	6127	5	6127	...	..	6127	6105	...	...	...	...	...	...	...	...	...	...	...	...	...	...	22
Albany ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	5	6127	5	6127	...	...	6127	6105	...	...	..	...	...	...	...	...	...	...	...	...	...	...	22

Department of Agriculture,
9th March, 1903.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

AGRICULTURAL BANK AND STOCK DEPARTMENT.

The Public are notified that the Offices of the above Departments have been transferred to the West Australian Chambers, St. George's Terrace.

NOTES.

Poultry Lecture.—A most interesting lecture was delivered at Claremont to the local Poultry Society, which we reproduce in this issue.

Bridgetown.—A trip through the district of Bridgetown is well described in an article appearing in this issue, and should be read by all those interested.

Poultry Expert.—Mr. F. H. Robertson, who is well known in poultry circles, has been appointed Poultry Expert to the Department of Agriculture. It is hoped that settlers and others who desire information on poultry matters will write to the Department, when their queries will be attended to.

Experimental Plots.—The Hon. the Minister for Lands has decided to establish some experimental plots on land lent for the purpose at Newcastle, Northam, York, and at the Narrogin farm. Further particulars will be published in the next issue, and all settlers in these districts are invited to visit these plots and to watch the results.

Stud Bulls.—Dairy farmers are notified that the Department of Agriculture has one Kerry and a Jersey bull available for stud purposes. Applications are invited for the loan of both or either of these animals. All applications should be addressed to the Director of the Department of Agriculture, from whom all particulars may be obtained.

Student Seeks Employment.—The Department is in receipt of a letter from a correspondent in India who is desirous of sending his son, age 16, to this State to learn farming and fruit growing. The lad is described as being strong, healthy, well educated, and musical, and his parents are desirous of placing him with some settler who would be able to give some theoretical as well as practical training in mixed farming, fruit growing, and wine making, and who would treat him as one of the family. The Department will be glad to receive offers from settlers willing to comply with this request.

Artesian Bores.—According to the Statistical Register for 1901 (just issued in part), there are 64 Government artesian bores in New South Wales, having a combined daily flow of 40,150,000 gallons, and 20 bores requiring pumping. In addition, there are 150 private bores, with a flow of 68,500,000 gallons; but this does not include a number of private bores, particulars about the flow of which were not obtainable. The highest recorded temperature of the water at point of emission is at the Clifton and Tinaroo bores, between Wanaaring and Milparinka, where 139 degrees are recorded, and the lowest is 70 degrees.—*Exchange.*

Capped Elbow.—Horses are often subjected to what is commonly known as a capped elbow. This is brought about by the part being repeatedly bruised by the heel of the shoe when the animal is lying down, so that the shoe should be removed for a few days if the horse can be allowed to rest; if not, a boot made for the purpose should be fastened on whenever he is in the stable and likely to lie down. Bathe the enlargement two or three times each day, and apply a cooling lotion after each bathing, and in a few days it will either gather and discharge matter, or a firm tumour may form under the skin, which can only be removed by a surgical operation. If it gathers, a free vent should be given to the matter, and an antiseptic dressing applied to the inside of the wound with a feather night and morning.—*Exchange.*

Producers' Conference.—The tenth annual conference of the producers of the State was held at the Department of Agriculture on the 24th, 25th, 26th, and 27th of March last. The conference was opened by a very able speech by the Hon. the Premier. The work done by the delegates was all of a useful nature, and it is to be hoped that good will result from their labours. Two breaks were made during the sitting, one on Thursday afternoon, which partook of an excursion down the river, and the second on Friday, when a visit was made to the Zoo. Those attending freely appreciated the outings, and evidently thoroughly enjoyed themselves. It was noticeable that many of those attending the conference availed themselves of a talk with the officers of the Department, all of whom had made it a point to be present the whole time, so that they could answer any questions and give advice when needed. A full report of the proceedings appear in this issue.

Soil Bacteriology.—Studies in soil bacteriology is the subject of a report by F. D. Chester, of the Delaware agricultural experiment station. It is a preliminary report on uncompleted investigations relating mainly to the study of methods of determining the number of bacteria in soil samples, the numerical distribution of bacteria in soil, and the conditions (acidity, influence of lime and other fertilisers, etc.) affecting the number and distribution of the soil organisms. The results of pot experiments with lime and other fertilisers indicate that—(1.) Lime diminishes the acidity of the soil, but not in the degree which would be expected. It would, therefore, appear that soil acidity must in a measure be due to substances which the lime does not neutralise. The basic slag slightly reduced acidity, while the muriate of potash was without effect. (2.) The study of pots to which nothing was applied shows that the number of bacteria undergoes fluctuations. In other words, death of bacteria and multiplication are concurrent phenomena, and there may be gain or loss dependent upon conditions, favourable or unfavourable, during certain intervals. (3.) In the pots which received no treatment, a general level of bacteria was maintained throughout the experiment. (4.) The addition of lime had a marked tendency to increase the number of bacteria in the soil, which was most marked when the larger quantities were applied. (5.) Neither Thomas slag nor muriate of potash had any appreciable effect in increasing the number of bacteria in the soil.

WEATHER-MAKING A DELUSION.—Considerable money and not a little thought and energy have been frittered away in recent years in various parts of the world (says an exchange) in efforts to change weather conditions by the use of high explosives. Extensive experiments in this line were conducted in Kansas and Texas, U.S.A., several seasons ago, the special aim in these being to break a prolonged drought and produce a rainfall by firing off heavy cannon. No valuable results were derived from these tests. Within the past year experiments on a larger and more elaborate scale have been conducted in the wine-growing districts of Italy and France, with a view of preventing hail-storms, by the use of cannon specially contrived for the purpose. The efforts made in this direction in the countries named were successful enough to attract widespread attention in Europe, and have led to the calling of a "congress" to discuss the subject and devise measures for the extension of the system of alleged prevention. Professor Willis L. Moore, acting United States Secretary of Agriculture, has recently issued a statement in regard to the matter. In this he expresses the opinion that the idea of preventing hail-storms or producing rain by the use of explosives is a delusion, and that "efforts should be made to prevent its spread in this country." The energy expended by nature in the production of a storm of any kind (says Professor Moore) probably exceeds the energy of all the steam-engines and cannon in the world, and it is utterly vain and useless to endeavour to combat Nature along these lines. These are the views of a man who has made a life-long study of weather conditions, and they are undoubtedly sensible and right. The notion that the firing off of cannon can either produce rain or prevent hail has about as little of reason or scientific principle in its favour as the Keely motor or the invention of a perpetual-motion machine, over which many lives have been wasted and a vast amount of money has been expended.

AGRICULTURAL LECTURES.

By A. Despeissis.

SEVENTEENTH LECTURE.

CONDITIONS WHICH GOVERN THE CHOICE OF CROPS.

1. *Suitability of the Climate.*—If diversity of soil necessarily modifies the practice of the agriculturist, that of climate does so far more powerfully. The soils of the different parts of the globe do not very materially differ from each other, and yet their vegetable products vary in the extreme. This is chiefly owing to differences in temperature, which decreases more or less regularly as—

(1.) We recede from the Equator; or,

(2.) Ascend from the sea level. Places in the same latitude and at the same elevation are found, however, to vary exceedingly in temperature.

(3.) According to their aspects, the prevailing winds to which they are exposed, their proximity to seas and large bodies of water or mountains, and the conditions of their surfaces; thus, turnips like cold moist climates, where oats take the place of wheat.

2. *The character of the Soil, Physical and Chemical.*—The soil constituting the subject matter on which the agriculturist operates, the character of the soil naturally regulates, to a large extent, the nature of his proceedings.

3. *Vital Power of the Plant.*—Continuous cropping of one kind of crops impoverishes the land or fouls it; and therefore the vitality of the plant should govern the choice of cropping.

4. Economical and mechanical working of the farm influence the choice of crops which are harvested at different times, so that labour may be more equally spread over the year.

5. *Market for the Produce.*—Every little advantage that may be got on local markets must have full consideration. The proximity of cities and towns or of populous centres implies a demand for dairy produce and vegetables, as well as for provender and litter, and at the same time affords an ample supply of manure to aid in their production. Such commodities, for their bulk or perishable nature, do not admit of long carriage. The supplies of these must

therefore be drawn from comparatively limited areas, and the character of the husbandry pursued there is determined apart from those general influences previously referred to.

SOME CULTIVATED CROPS.

THE CEREALS.

The word "cereal" is derived from *Ceres*, the goddess of corn.

The chief object of the growth of cereals is to obtain the grain or seed. The cereals embrace all those annual grasses used for the above purpose, and include wheat, barley, oats, rye, maize, rice, and millet. Buckwheat might be added, in a practical classification, although, strictly speaking, it is not a cereal; but its seeds have much the same quality and are used for the same purpose as those of the cereals properly so-called.

Although originally offering a great many cultural points in common, their natural period of growth or time of ripening now differs considerably, certain of them requiring a longer time for their growth and maturity than others. This has been achieved by selection and cultivation under artificial circumstances; and the result has been races of winter and of spring varieties, the former being sown in the autumn and the latter in the early spring.

In several characteristics cereal crops show a family likeness. Their roots, although regarded as "shallow feeders," penetrate to a great depth—three feet or more—that depth corresponding with the drought resisting power and period of growth.

Cereals are considered "exhaustive crops." Their power of acquiring food is greater than that of root crops, and the food constituents gathered are largely transferred from the stalk and flags to the grain, where they are concentrated; and, as these are sold away from the farm, a direct loss ensues.

WHEAT CROPS.

Natural Order—*Gramineæ*.
Botanical Name—*Triticum*.

To the genus *Triticum* belongs a good many of our inveterate weeds, for example, *Triticum repens*, or couch grass.

Wheat is the most important of all our cereal crops, for it is the grain from which we obtain the flour so generally used for making bread. The range of growth is also very wide. It is found to be grown profitably in the tropics, as well as in the cooler temperate latitudes. This is due to the immense variety of species of wheat, of which there are more than of any other corn; and this arises from the great desire to use the best and most suitable seeds.

In classifying the various species, different authorities have adopted different arrangements. One of the best appears to be that of Vilmorin, which is generally adopted. Under this classification wheat is arranged under seven species:—

(1.) *Triticum sativum* or *vulgare* (common wheat).
(2.) „ *turgidum* (turgid wheat, Egyptian or "mummy" wheat).
(3.) „ *durum* (hard wheats, macaroni wheat).
(4.) „ *polonicum* (Polish wheat).
(5.) „ *amyleum* (starch wheat).
(6.) „ *spelta* (spelt wheat).
(7.) „ *monococcum* (one-rowed wheat).

The first two include all the varieties grown in this country. *Triticum sativum* is the most important, the different varieties grown in Europe or Australia belonging principally to it; the *Triticum turgidum* comprising only the varieties grown in less favoured soils, and are characterised by their large yield of a coarse quality of grain.

Wheat, as cultivated with us, may be divided into two great classes—the "smooth" and the "bearded." The most common classification, and the one adopted in the market, is, however, according to colour, viz., "white" or "red."

Though originally the same, they have acquired these colours after having been grown for a number of years on a particular class of soil, and in a particular climate.

The "white wheat" is finer and more delicate, and needs much warmth in the summer to grow to perfection. The grain is distinguished by producing but little bran, and that of a fine texture, together with an abundance of the best flour; and it is capable of yielding a large produce per acre.

The red wheat has greater hardihood of character, and stands rough weather, yielding a produce having a rather coarse texture. It bears larger crops. The corn, when ground, yields a strong bran and a somewhat inferior flour.

But these wheats have no great permanency of character. When grown on poor soil, the white wheat looses its colour and turns grey or red, though it retains the straw of the white wheat.

In the market the white wheat brings somewhat more per quarter than red wheat. The respective price of each is, however, now more even, as much better flour can be obtained from red wheat with the new improved grinding mills.

The white wheat is considerably softer than the red wheat. The red wheat being more hardy and less liable to diseases than the finer white wheat, a recurrence of unfavourable seasons always leads to an increased cultivation of them.

There are a great number of varieties of wheats, and they are constantly being augmented by the accidental discovery of new varieties, or by cross-impregnations artificially brought about for this purpose.

Triticum Turgidum.—The cultivation of this class of wheat is limited to certain districts where the soils are cold and strong, and where a large yield of coarse quality is desired.

All the varieties of *T. sativum* have the straw cylindrical in shape, and hollow. In the *T. turgidum* and its varieties the interior of the straw is occupied more or less completely by a pithy substance which gives it toughness and strength, and the grain or seeds have a less regular and symmetrical shape than those already described. The varieties of turgid wheat are generally hardy, vigorous, and very productive, with long, tough, coarse straw. Having a low nutritive value, and being unpalatable to cattle, it is unsuitable for fodder, but where straw is in demand for thatching, litter, or similar purposes, this description of wheat is usually found to be more remunerative than the finer qualities, especially in cold, heavy soils. The ear is always "bearded" (awned).

T. durum (hard wheat or macaroni wheat) exhibits a great endurance of drought in Eastern Russia, Turkestan, and Southern Algeria. These wheats flourish in the most arid localities, with a rainfall of 8 to 10 inches.

In the driest States of America, in a number of instances, these varieties, when grown in the same locality with the ordinary bread wheats, have given, in seasons of unusual drought, a yield two to four times as great as that of the ordinary wheats.

In addition to drought resistance, the varieties have also the advantage of being resistant to the attacks of "leaf-rust" and other parasitic fungi.

The only uncertain feature of the successful cultivation of macaroni wheats is the limited demand, although at present, with us, millers cannot afford to be as exacting in the choice of the wheat they require as they will, no doubt, prove to be when the demand is more abundantly supplied.

When macaroni wheat is mixed with 20 per cent. or 25 per cent. of red wheat in grinding, it makes what is considered a good quality of flour for bread.

Harvest.—The best indication of harvest-time is given by the changed colour of the straw immediately below the head. When this changes from green to yellow, which it does before the body of the straw changes, the circulation of the plant is arrested, and the head can receive no more nourishment from the roots; we know that it can derive none from the air, and therefore at this period must contain within itself all that is necessary for its perfection, whether it be cut at once or left standing any longer time. If this be admitted, then it is clearly to the interest of the farmer to run no further risk of injury from change of weather, birds, and fires, and without loss of time to cut it down and get it safely housed as soon as possible.

The most important constituents of wheat—bran, flour, and gluten—are also affected in their proportion by the time of cutting.

It is generally considered that the last process of maturation of the grain is the perfecting of the testa or seed-coat (bran).

For milling purposes, and for ordinary use as food, the less the proportion of bran the better; this we secure by cutting as soon as we perceive the change indicated.

For wheat seed, on the reverse, it is important that the seed be well matured—that the seed-coat or bran should be perfected—to enable it to preserve the seed for the purpose of vegetation. In this case, it is desirable to leave it standing until full ripe.

Proportion of Head to Straw:—

1. Where the straw is long and the head small, it will require 36 cubic feet to yield one bushel of grain.

2. In an average crop, 27 cubic feet will yield one bushel of grain.

3. In a crop with short straw and full, large heads, about 21 to 22 cubic feet will average one bushel of grain.

The straw may be taken at about double the weight of the grain in average crops; or we may calculate that each cubic yard of the stack will yield, on the average, 1 cwt. of straw.

EIGHTEENTH LECTURE.

Barley.

Barley, like wheat and other cereals, belongs to the natural order *Gramineæ*. Its botanical genus is *Hordeum*.

It takes the second place in the order of the cereal crops in temperate climates. In colder climates oats supersedes it.

Barley has a great range of cultivation. It comes to maturity in almost every climate in the world; and this is grown in the torrid as well as in the brief but hot summers of those countries verging on the frigid zones.

It is largely grown and used as a bread corn in those cold climates where wheat cannot be successfully cultivated, and it is equally grown and used as food for horses and cattle in the arid countries of the East of Europe, whose dry and hot climates render the cultivation of the oat impracticable.

It suffers more from intense heat than either of the other cereals.

The name "*Hordeum*" is said to be derived from *hordus*, which means heavy, because the meal, containing less gluten than that of wheat, makes heavier bread.

Three species are in cultivation:—

(1.) *H. distichum*, cr the ordinary two-rowed barley.

(2.) *H. vulgare*, or the ordinary four-rowed barley or "bere" barley.

(3.) *H. hexastichum*, the six-rowed barley.

To these a fourth species is sometimes added:—

(4.) *H. zeocriton*, spratt or battledore barley, German rice, or rice barley.

I. HORDEUM DISTICHUM, or the two-rowed barley, is the species in ordinary cultivation in England. In the Northernmost parts of Scotland the four-rowed barley is still considered the most suitable.

It is easily distinguished from the other species of barley by the ear being more elongated and of equal breadth throughout, and by the grains being attached to the central axis in an imbricated manner, partially overlapping each other, instead of standing out from it, as they do more or less in the other species.

The favourite varieties are:—

"Chevalier," with a long ear—4½ to 5 inches long—and from 14 to 18 grains on a side. Its grain is of a pale golden colour, plump and round at the end. The skin fine, mellow, and less wrinkled than in most other varieties. It packs close, and weighs heavy to the bushel. The straw is stout and stands up well, rendering it suitable for rich soils, where its yield is generally very good.

"Golden Drop."—Stout, erect stem, of a bright yellow colour; hence its name, "Golden." It is surmounted by a short, broad, compact ear, with grains full-sized, plump, and round, with fine skin. It is moderately hardy and early, and is a large cropper.

The grain malts well, and fetches a good price, though the quality is not equal to that of "Chevalier."

AWNLESS OR BEARDLESS BARLEY.—The awns drop off during the early growth of the ear. The heads, accordingly, do not droop down so much, but the grains are not so well protected from the wet.

II. HORDEUM VULGARE, OR BERE BARLEY, is the name of a coarse, hardy, four-rowed barley grown in Ireland and in the North of Scotland. It yields most of the barley used in the distillation of whisky.

The "common Bere" differs greatly in appearance from the two-rowed barley. The ears are thicker and shorter, and contain 40 to 50 grains, arranged round the central axis in two single and two double rows. The grain is thin, pointed at both ends; weighs light—generally 40 to 45lbs. per bushel, only. The awns are long, and adhere to the grain firmly.

The "Victoria Bere" is an improved variety, with much heavier grain. Another variety of the same type is the Winter White, a coarse productive kind, suitable for winter sowing in late exposed districts, as it comes to maturity a fortnight earlier than any sown in the spring.

"Peruvian or Skinless" is a naked variety of *Hordeum vulgare*. It thrives best where a short but hot summer enables it to effect a short and rapid growth. When grown under favourable conditions, and the produce is consumed at home, naked barleys certainly give the most remunerative returns, as the yield is large, and the weight per bushel much heavier than the finest sample of ordinary barley. There is often some difficulty in disposing of them on the market, where they generally fail to fetch a price equal to their comparative value.

III. HORDEUM HEXASTICHUM (the six-rowed barley) offers but little inducement for cultivation in European countries.

IV. HORDEUM ZEOCRITON (fan or battledore barley) is rarely met with in cultivation, being only grown for illustrative or experimental purposes. Ear short, very broad at the base, and tapering at the extremity.

Cultivation.—Agriculturally speaking, their range is from the lightest gravels up to the medium loams; beyond a medium loam, the larger proportion of clay renders the soil unfit for the cultivation of barley, and gives better returns if sown down with oats or wheat.

A crop of barley extracting from the soil the same substances and in the same quantities as wheat does, and its growth being more rapid wherever its root system is shorter and less vigorous, it requires these substances to be in a state ready for immediate assimilation. No steeping or "pickling" process is applied to seed barley, though it is attacked by smut.

The methods of sowing are similar to those described in reference to wheat. The broadcast machine, however, is probably more generally employed in barley than in wheat sowing, and in that case more seed is required.

It is absolutely necessary to have a fine tilth. "A bushel of March dust is worth its weight in gold" is an axiom with the English farmer.

Harvesting should commence directly the ear loses the last tint of pinkish hue and assumes the yellow tint of maturity, at which period the neck of the straw also indicates, by its changed colour, that the circulation of the plant is arrested and the head begins to droop. The grain at this period possesses its highest nutritive value, the after process of maturation having reference principally to the formation of the seed-coat or protecting husk.

When barley is to be used for malting it must be harvested when fully ripe, and that is after the ears droop and have lost their pinkish hue. The object is that for malting it is important to have the grain all of one stage and ripeness, so that it shall germinate simultaneously.

If barley be intended for seed, it is desirable that harvest be delayed some few days later, as may be convenient.

In dry weather the straw becomes brittle and a large quantity of the crop is left on the ground, and in the wet weather the grain is very apt to sprout in the ear, and is thus effectively spoilt for malting and greatly deteriorated for feeding purposes.

The practice with regard to harvesting is to cut out and lay the corn in swathe, as in mowing grass.

The thrashing is the same as for wheat: the flail, the horse-power, and the steam thrashing machine.

By each, however, a greater quantity of barley is thrashed out in a given time than of wheat, on the average one-fourth to one-third more, and therefore the cost per bushel is proportionately lessened. Barley, however, requires an additional process to fit it for use—that of "hummelling," or separating the awns from the grain. In the combined thrashing machine this forms a portion of the work, and adds nothing practically to the cost.

Yield of Barley.—In the best barley districts 56 to 64 bushels per acre (seven to eight quarters) are obtained, but the best samples for malting average 40 to 50 bushels (five to six quarters):—

Barley weighs 50 to 56 lbs. per bushel.
Wheat ,, 62 ,, 66 ,, ,,
Oats ,, 38 ,, 45 ,, ,,

In the stack:—

A small crop will require 27 cubic feet to yield one bushel.
An average crop ,, ,, 21 ,, ,, ,,
A large crop ,, ,, 18 ,, ,, ,,

Barley a good Fodder Crop.—For green feeding the barley crop is a universal favourite, more especially the skinless or naked barley. In the first instance it is a remarkably quick grower, and it grows in the winter time, when other crops move slowly.

Besides, barley is a very nutritious crop. The relation between grain and straw is very close. Hellriegel, who conducted investigations in that direction, found 44 to 48 per cent. grain, the same straw, and 6 to 8 per cent. chaff. Of course, every particle of the plant above ground was saved in this case, and no kernal of grain was lost in any way; while in the field there is much waste. In field practice, however, the proportion of grain to straw is often as 2 : 3. It is no wonder that the straw is thought to have considerable value as fodder; in fact, more so than the straw of wheat or rye.

Why Barley is used for Beer.—Any starchy seed may be used for making beer, provided it is made to germinate or malt; but barley is more generally used on account of the larger proportion of unorganised ferments, known as "diastase" or "maltin," it contains, which acts on starchy seeds, changing the starch into sugar and dextrin at the time of germination.

That sugar and dextrin is, in turn, converted through the agency of the yeast fungus into alcohol during the process of fermentation.

It is estimated that one part of "diastase" is capable of changing one to two thousand parts of starch to sugar, provided it is made to act at a temperature of about 150° F.

"Maltin" is even more active than "diastase," and is capable of converting one to two hundred thousand parts of starch into a soluble condition. Now, when it is known that barley contains as much as 1 per cent. of "maltin," one can imagine what help it is to the brewer in converting starch into sugar and sugar into beer.

Malting is simply an artificial method of germination. The grain is first steeped in water, swells, and is then thrown into heaps. There it begins to heat, and in a few days "sprouts" or throws out rootlets. The grain is then spread out to check the heat. When the rootlets have grown to a length equal to that of the grain the progress of germination is suddenly stopped by passing the grain through a kiln.

As these rootlets are not required any more, they are separated through a screen and sold as "malt combs" for feeding cattle.

The malted grain can then be mixed with fresh grain, crushed, made into a mash with warm water, and in the course of a few hours converts the whole of the starch in the mixture into sugar; this sugar is next transformed into alcohol by fermenting it with yeast. When beer is made, a certain quantity of hops is added to this. If, on the other hand, it is intended to make whisky, the mash is distilled to separate the alcoholic liquid.

OATS.

The oat is another cereal which belongs to the natural order (*Gramineæ*). Botanically it belongs to the genus *Avena.*

The plant is hardier than either wheat or barley. The wide range of soils that the crop possesses, and the comparatively low temperature under which it comes to maturity, have rendered it well adapted for cultivation at high latitudes.

The polar limit of oats corresponds with that of rye, and South of the parallel of Paris in the Northern Hemisphere (48°·5) we rarely see oats in cultivation.

In Spain and Portugal they are hardly known at all, yet they are successfully cultivated in Bengal in lat. 25°. Here probably the moisture of the soil compensates for the high temperature of the climate.

In Australia oats do likewise better in a cool, moist climate than in a drier and warmer locality.

New Zealand is famous, amongst all cereals, for its oat crops, the yield being from 40 to 80 bushels per acre and weight 40lbs. per bushel.

With us, in Western Australia, the oat crop is more profitable in the cooler and moister South-West districts than in the drier and warmer Eastern districts.

The oat crop is not so fastidious as wheat and barley are, either with regard to the richness or the tilth of the soil, and on account of these considerations are often grown on very poor land; and yet oats are grateful for manure and respond handsomely to its application.

As a first crop on freshly-cleared ground, and on newly-broken sod-land or on peaty soils also, oats do better than the more exacting barley or wheat—

Oats grow on soil containing 2 per cent. organic matter.
Barley grows on soil „ 3 „ „
Wheat „ „ „ 4 „ „

Oats, like barley, have the grain covered with the flowering glumes which, however, adhere less closely and are therefore more easily removed. By drying in a kiln or oven, the separation of the coats of the grain is made easier, and, after the husk has been removed in a mill, the groats or grits which remain are ground into oatmeal.

In Northern Europe, oats enter into human consumption to a far greater extent than anywhere else.

In moist countries, however, oats are cultivated as a horse-corn. It has the power to excite as well as to nourish the animals that feed upon it.

The stimulating effect of oats is due to the excitant which has been named "Avenin." This substance acts on the motor cells of the nervous system. Indeed, so noticeable is this effect, that in hotter climates barley is preferred, as the stimulating effect of oats on the nervous system of horses is increased to an injurious extent by the action of the warmer climate.

Whilst investigating into the presence in oats and the effect on animals of "Avenin," Sanson, curiously enough, found that crushing or grinding the oats perceptibly weakens their power of excitation, air probably destroying the avenin.

Crushed oats, on the other hand, are more nutritious and more easily digested, whole oats often being passed through the horse, especially those given to bolting their food, in an undigested state.

New oats and working horses do not, as a rule, agree. The oats loosen the animals, cause them to fall out of condition, and become "soft" and sweat easily. After a few months, and especially after cold weather has set in, the oats apparently undergo a kind of after-ripening, which improves their condition, and then they become fit for horses to feed upon. A bushel of old oats is considered by ostlers to be the most warming and nutritious ration that can be given to a horse after a tiring and long journey, but never new oats.

NINETEENTH LECTURE.

Classification.—The species of oats in cultivation are:—

(1.) *Avena sativa* (the common oats).
(2.) „ *orientalis* (the Tartarian oats).
(3.) „ *brevis* (the short oat).
(4.) „ *nuda* (the naked oat).
(5.) „ *strigosa* (the bristle-pointed oats).

A very troublesome species of weed (*A. fatua*, or wild oat) is frequently met with, especially in fields which have been put under wheat continuously for a number of years.

I. A. SATIVA, OR COMMON OATS.—The following have for a long time been favourite oats of this class:—

Potato Oat.—Named from having originally been found growing in a field of potatoes in Cumberland. It is a short-strawed beardless oat, with a grain white, short, and plump. It is highly esteemed for mealing and for feeding purposes. It sheds very readily during harvesting, and must therefore be cut before it loses its green colour. Weighs heavy (42 to 46lbs. per bushel).

The Sandy Oat.—A hardier variety than the potato oat; possesses remarkably stiff straw, and is especially adapted to soft and peaty soils.

Winter Dun.—Sown early in the autumn, and frequently fed down by sheep, and then allowed to stand for seed. The husk has a nasty, dirty, brownish colour. Very largely grown in the Southern counties of England. In the market the colour and the thick husks are against it. They are, however, of heavy weight (43lbs. per bushel).

II. AVENA ORIENTALIS, OR TARTARY OATS.—This species differs greatly in appearance from the *A. sativa* by having its panicle more contracted, and altogether confined to one side, and in having larger glumes.

Black Tartarian Oat.—A very productive variety, with short, stout straw. The grain has long and black husks with a little yellow tip; consequently it is a light-weighing oat (38 to 39lbs. per bushel). The yield is, under favourable conditions, very large.

White Tartarian Oat.—The colour is a little whiter than that of Winter Dun. Straw very tall and stout; extremely hardy, and grown in some of the coldest districts.

III. A. **Brevis, or Short Oat.**—Hardy and prolific; grain very plump and of a dark colour. On the continent of Europe it is the favourite oat of the mountainous countries of France and Spain on account of its earliness and suitability for poor elevated soils.

IV. A. **Nuda, or Naked Oat.**—Prolific and thrives on inferior soils, particularly those of a peaty character. Its great drawback is its tendency to shell out at harvest time.

V. A. **Strigosa, or Bristle-pointed Oat** bears a certain amount of resemblance to *A. Fatua*, or the Wild Oat, is grown for fodder on the continent of Europe.

Harvesting.—Oats should be cut as soon as the slightest change shows itself in the colour of the straw immediately underneath the panicle, no matter how green the stem may be, and not be allowed to stand on the ground until they are dead ripe, as in that condition they cannot be cut nor moved without separating a large portion of the grain. When cut early, they require a little longer in the stook, where the last process of maturation (ripening) is as perfectly carried on as if they were standing uncut in the soil where they had grown. The grain is quite matured, but the chaff having been cut before it was fully ripe and dry, adheres to it, and retains it in the ear more firmly, and thus lessens the chances of "shelling out" as it is being carted and stacked. In order to protect the grain in the stooks from the action of the weather, it is customary in late districts to "cap" or "hood" the stooks by placing a couple of sheaves butt to butt on the top of each stook.

Yield in the Field:—

A small crop ...	32 bushels ...	240 sheaves or	24 stooks.
A good crop ...	48 „ ...	320 „	32 „
A large crop ...	64 „ ...	480 „	48 „

Yield in the Stack:—

A poor yield	1 bushel per	18 cubic feet.
An average yield	1 „	13 „
A large yield	1 „	9 „

Oat straw by itself is generally preferred by cattle to any other straw, and horses especially are very fond of oaten hay. The oats cut green possess a larger amount of nutritive matter than when left later to become fully ripe. The oats cut green contain more watery juices and less indigestible woody fibre than the oats allowed to be fully matured. Thus green oats are always more readily digested in the animal organism and owe their superior feeding value to this circumstance, as well as to the absolutely larger proportion of nitrogen (flesh formers) compounds found both in the grain and the straw of the plant.

DIFFERENCES BETWEEN CORN CROPS DURING THE FIRST STAGES OF THEIR GROWTH.

Wheats, if taken as a type, have a couple of horns one above the other where the sheath of the blade encircles the stalk. These horns are of medium size, with a few thin silky hairs upon them.

The "colour" of the leaf is intermediate between the oat which is darker and the barley which is lighter.

The "blade" is broader than in the case of the barley, and then turns over, and the tip is curved in the opposite of the corkscrew, which turns from left to right.

BARLEY:—

(1.) The horns of the sheath are very long and perfectly free from hair.

(2.) The ligules are longer and more pointed than in the case of wheat.

(3.) The whole plant is destitute of hair.

(4.) The sheathing part is ribbed greenish, with whitish lines.

(5.) The blade turns slightly as in the case of the corkscrew (left to right) and then turns twice in the opposite direction.

OATS—

(1.) No horns whatever.

(2.) The ligule is intermediate between barley and wheat, and is of a rough appearance.

(3.) The plant is haired on the margin of the leaves.

(4.) The blade takes half a turn in the side of a screw, then one turn in the opposite direction, so an oat field has a more wriggling appearance than a wheat field and a less wriggling appearance than a barley or a rye field.

RYE.

Natural Order—*Gramineæ.*
Genus—*Secale Cereale.*

Rye is the least grown in this country of common corn crops. In many countries, however, such as the continent of Europe, rye still holds a very important position; there it is used as a bread corn as we use wheat, and also for brewing and distilling purposes, as we use our barley.

It is indeed the characteristic food-grain of middle and Northern Europe, and forms the principal vegetable sustenance of about one-third of the population of Europe.

When used in the distilleries, only a portion of the grain is consumed; the remainder forms an excellent food for cattle, and thus contributes to the fertility of the soil. In the South of Europe, rye is more rarely met with. There the growing season is longer and more suitable for slower-growing grain of a superior value as food, while the grape forms the spirituous drinks of the country.

Rye is distinguished from wheat or barley—

(1.) In bearing naked seeds on a flat ear, with awns like barley.

(2.) The straw, instead of being hollow and tubular, is lined with a pith-like substance which gives it a greater degree of solidity and strength, and renders it particularly valuable for litter and certain economic purposes, though it diminishes its value as a fodder substance for cattle.

There are two well-marked varieties of Rye (the Winter and the Spring), which are cultivated like the Winter and Spring wheat.

The following are the principal varieties cultivated :—

Common or Winter Rye.—Generally grown both in England and on the continent of Europe, and produces the bulk of the rye grain which is used as a bread-corn, or for feeding or economic purposes.

St. John's Day or Midsummer Rye.—So called from the period at which it is generally sown. It is eaten down by sheep in the autumn and again in the early spring months, after which it is allowed to stand for a crop. Tillers abundantly.

Russian Rye resembles *St. John's Day* in the luxuriance of its growth ; the straw is longer and stouter and attains a height of 7 to 8 feet ; does not tiller to the same extent.

Giant, or *Tyrolese,* resembles very much the Russian in its luxuriance and vigorous habit of growth. It is ten to twelve days earlier than the Common rye, and is preferred for a better class of soil.

Rye is essentially the bread-corn of the light and poor description of soil, while wheat is that of the heavier and rich soils ; neither of them succeeding so well on the soils suitable for the other as on their own.

Rye also thrives very well on unreclaimed peat or moorlands, and has been recommended as a good preparation for subsequent tillage crops.

The same preparation of the soil is required as for other cereals, but, being grown generally on lighter soils, this is achieved generally without much labour. It is not the custom to steep the seed previous to sowing, as rye does not appear to be subject to either of the fungoid diseases to which the other cereals are liable.

The weight per bushel is the same as barley, *i.e.*, 50-56lbs.

The straw in some places is an important item in the produce of the crops. Its toughness and strength renders it valuable for stuffing collars. For brick making, there is also a large demand for it. For fodder being too tough and rigid and less easily digested, it is less valued than either wheat or barley straw.

For litter purposes, it is the best of all cereals and is readily sold at good prices in the vicinity of large cities for stable use.

Proportion of straw to grain is as 10 is to 4.

MAIZE.

Maize is one of the most important of the cereals cultivated in tropical and sub-tropical countries.

It is sometimes called corn or Indian corn, as it was found in cultivation among the Indians on the discovery of America.

Maize soil should be rich, deep, friable, with plenty of humus or vegetable mould. The alluvial banks of rivers and streams often answer their requisites.

The crop is very sensitive to frosts, and for that reason should not be sown too early in the spring, nor in cold hollows of our inland hilly country. It also requires a good deal of moisture.

The ploughing should be deep, and the preparation of the ground thorough.

Before sowing, the ground is marked by means of a corn-marker, which lays off the field in long parallel lines about four feet apart, the distance between varying according to the kind of corn which is planted, the smaller variety requiring less space than the larger. This implement is followed up by a single furrow plough with a double mouldboard.

The seeds are sometimes soaked some hours before planting, and coated with tar to keep off cockatoos and other birds.

They are either planted by hand and dropped three at a time along the line at intervals, and covered with about two inches of soil; or they are drilled by means of the corn planter.

Pumpkins are often sown along with corn, and thus two crops are made to grow on the same ground, requiring different plant food. The pumpkins are sown every fourth row, about 15 to 20 feet apart. Their vines spread and shade the soil from the drying affect of the baking sun, and also smother the weeds; whilst the corn, on the other hand, shade the pumpkins from the sun, and offer a support to which the tendrils cling.

When the sowing is done the scarifier is kept going until the pumpkin vines begin to spread.

Hilling-up or hoeing the soil up towards the stalks, which is a common practice in Australia, is condemned in America. This practice tends to increasing the evaporating surface of the ground and to loss of moisture.

Of the varieties grown, many find favour. The yellow varieties are the best for general purposes, and the white, such as "sweet corn" and "pop corn" for table use and for human food, and also for fodder and ensilage. The varieties also differ very much in regard to yield, quality of grain, and date of ripening. Early varieties are generally the best, as least likely to be affected by frosts.

Golden King and *Early Mastodon* are much favoured in Queensland for excellence of grain and perfection of cob.

Harvesting.—The period of tasselling is a critical one for the maize crop. If the weather be hot and dry the pollen from the flower-head may not fecundate the tassel, and the grain fails to set.

Just before the stalk begins to turn yellow the tops are at times cut above the cob for fodder purposes. This part of the plant is no longer necessary after the fecundating period, and may, on that account, be removed. Soon after the grain has glazed harvesting may take place if it is intended to use the crop for fodder. If for grain, harvesting may be delayed for a few days.

This may be done by cutting the maize into bundles, and stooking it upright, and firmly tied up at the top in heaps of four together; or the cobs may be pulled from the standing stalks, cattle being afterwards turned into the crop to eat what they can of the stalks.

As the cobs are pulled off, they have their husks torn off by means of a husking pin fitted to a strap on the hand, and carted to the shed to dry, when they are thrashed or "shelled." This is a tedious process unless done by one of the many machines which, at a small cost, effect the shelling, grading, winnowing, and bagging of the grain in one operation.

It takes two bushels of maize on the cob to make a bushel of shelled grain. Two cubic feet of sound dry corn will give that yield.

TWENTIETH LECTURE.

MILLET AND SORGHUM.

Millet and sorghum are also very useful cereal crops. The popular names given to the various species are so numerous and so confused that great care is necessary in distinguishing them. They are grown for fodder, for grain, for sugar, and for supplying the raw material used in the manufacture of brooms and brushes.

They are especially adapted for dry, hot climates, and grow right through the summer months. In fertile, moist land they, of course, yield larger crops; but, as a class, they are very accommodating as regards soil and climate, provided they are not grown during the frost season.

The ground should be deeply ploughed, and, by cross cultivation and harvesting, should be reduced to a fine tilth.

Sowing in the South-West districts of W.A. may commence towards the end of August as a catch crop or an auxiliary summer crop, after wheat or oats. They may be sown much later in those fields which retain a moderate amount of moisture during the summer. For that purpose the stubble is ploughed immediately after the corn harvest, ploughed and cultivated and made ready for sowing the millets or sorghum.

These crops are generally sown in drills or lines about three feet apart. The seeds are deposited one or two inches deep; they do not require a large amount of moisture to germinate. If the season is inclined to be dry, the drills should not be kept long open, but should be covered in before they are dried by exposure to the sun and wind.

The seeds are sown five or six inches in the rows; 10lbs. to 15lbs. of seeds are required to the acre.

As soon as the drills or lines are well defined, the horse-hoe is set going to kill the weeds, and, by checking the escape of moisture, to stimulate the growth of the young plants. If grown for grain or for broom and brush work, these are not allowed to grow too thickly, and the weaker plants are pulled out. A thick growth results in stunted and inferior heads.

I. FOR FODDER.—Millets and sorghum offer a great variety. Several are indigenous to Australia, such as—

The *Australian Millet (Panicum decompositum)*, a valuable grass found all over Australia. On the moist and rich banks of streams it grows up to four feet and more in height, whereas on the drier plains it rarely exceeds two feet. All stock are very fond of it; it makes excellent hay. The seeds were at one time collected by the aborigines, ground between stones, and the flour baked into cakes.

Johnson Grass or *Evergreen Millet (Sorghum or Andropogon alapense)*.—A most drought-resistant perennial fodder, very valuable as a pasture grass, but most troublesome in cultivated paddocks, when its fleshy, penetrating suckers take a good hold of the land.

Where it can be irrigated, it produces enormous crops, while on dry, parched-up land it remains green and succulent whilst all vegetation around flags and is dried up.

Horses and cattle are fond of it, either in its dry or green condition. It may be sown at the rate of about one bushel per acre, the seeds being lightly covered with a light brush.

It will grow in drift sand, and the abundant fleshy roots, by their decay, are said to enrich the ground rather than exhaust it. It may also be propagated by ploughing the land and scattering the underground stems along the furrows. In order to prevent the root stalks becoming matted near the surface, and the crops being affected by drought, the land under this grass is at times ploughed up every three years, which causes it to grow more thickly and vigorously.

In California, when grown on alkali land, where it generally thrives, its deep roots absorb so much of the unpalatable alkali that stock will not eat it.

In first planting in arid district seeds of that grass from plants grown on moist land, some trouble might at first result in getting them to re-establish, but with some amount of care the plants will soon establish themselves.

Farmers' Friend or Imphee.—This is a good all-round variety, but coarser in the stalk and slower in growth than amber cane. It gives a heavy first cut, but a very light second and third one, as it does not stand the hot, dry summer as well as the other varieties.

Early Amber Cane is, of the sweet sorghums sown for fodder, one of the most valuable. The seeds are sown in drills three feet apart, at the rate of 6lbs. to 12lbs. per acre in the spring; surface cultivation fosters growth and early maturity.

A check in its growth makes it bitter and unpalatable, and it should only be sown where continuous growth is assured. It may be fed green or made into ensilage. If fed green, one should wait until the ear has shot out, as all sweet sorghums are more or less poisonous in the early stage of their growth. All stock are fond of it, horses, cattle, and pigs fattening on it when the plant nears maturity, when it is rich in sugar. Although not producing the heaviest first crop, the second and third cuttings are comparatively heavier than those of the other varieties of fodder sorghums.

New Dakota Millet is also a valuable fodder plant. It is a vigorous grower, producing a heavy amount of foliage, and stands the hot, dry weather well. It is only excelled by the Pearl Millet. It makes better hay than Pearl Millet, and is much liked by cattle.

Pearl or *Egyptian Millet* (*Penicillaria spicata*) is, of all the plants of that family, the most useful for green fodder, hay, or ensilage. It is sown in drills, two or three seeds being dropped two feet apart in the drills; 4lbs. to 6lbs. will sow an acre. It first grows spreading on the ground, and when a couple of feet long shoots up erect.

Stock are very fond of it, and may eat it without danger in all stages of its growth. In three or four months' time it is fit to cut, when it sprouts up readily, and may be cut a second and third time.

The heavy yields are obtained on rich, moist soils, but it will also give a profitable return on poor soil and under the most trying circumstances.

Hungarian Millet.—This millet has long been very popular amongst dairy farmers in New South Wales for feeding green to milch cows. It also makes very good hay, being finer than most other varieties; but it does not yield as well as either Dakota or Pearl Millet, and cannot stand dry localities to the same extent.

The millets require very little cultivation, their rapid growth soon smothering weeds. The following table gives the comparative yield of the best three amongst a number of millets grown for green fodder, under like conditions at the Wagga Experimental Farm in New South Wales:—

Variety.	1st cutting.		2nd cutting.		3rd cutting.		Total.	
	Tons	cwts.	Tons	cwts.	Tons	cwts.	Tons	cwts.
Hungarian	4	3	1	13	1	4	7	0
Dakota	5	13	2	19	2	1	10	13
Pearl	12	9	3	17	2	1	18	5

I have gone into the consideration of this crop with greater detail than I have when dealing with the other more important cereal crops, because so little is known of them, and because it is a crop so well suited to the conditions which prevail in Australia.

MILLET HAY VERSUS WHEATEN AND OATEN HAY.—The wheat or oat crops at times fail with us owing to unseasonable weather, and, in many cases, the farmer could yet recoup himself of his loss by securing a crop of millet sown on the same land.

Millet is very easily made into hay, and can be cut with the binder. In that case, the crop should be harvested shortly before the heads have shown, and before the stalks become woody, when they may be injurious to stock.

In this way the farmers could sell the whole of their wheaten or oaten hay and feed their own stock on millet hay.

POISONOUS EFFECT OF GREEN SORGHUM.—It is a common experience amongst stock owners that numerous fatal accidents are on record of horses and cattle which have been allowed to feed too plentifully on green sorghums.

The trouble has been attributed to the animals being affected by hoven.

Some Indian authorities have expressed the belief that the trouble was due to the accumulations of nitrates of potash or saltpetre in the tissues of the plant when growing whilst young during a dry season.

Recent investigations have, however, traced the toxic affect of young sorghum on stock to the presence of prussic acid, or of cyanide of potassium, in the juices of young plants struggling through a dry season.

The poisonous substance disappears shortly after the blossoming stage, and when the ear begins to form; and it is also less pronounced in plants growing vigorously on moist land.

During the process of curing, or shortly after the sorghum has been cut, the poison also disappears, and when feeding stock with tender sorghums it is therefore advisable to only allow them a moderate amount of the fodder, until the seeds begin to form and to cut it and give it to them a day or so after. When this precaution is taken no accident result.

II. SORGHUMS FOR GRAIN.—These all belong to the non-saccharine varieties or sorghum. They are, as a rule, of smaller growth than those sorghums which are better fitted for fodder, the energies of the plant being directed to producing heavy crops of seeds rather than stalks and leaves.

For pig-feeding, the seed-producing sorghums are of great value. Under favourable conditions, they mature their seeds in from three to four months. They only grow three to four feet in height and the heavy seed heads are often seen hanging over.

Sorghum seeds have about the same feeding value as maize, and they offer this advantage over maize that they could be grown where a maize crop would prove a failure.

For poultry food and on large pheasant and partridge shooting reserves large quantities are consumed.

The varieties which have proved most profitable are:

Dhoura or Egyptian Corn.—The brown variety is considered the best. The plants grow vigorously and stool properly, from 5 to 10 full stalks growing from a single seed. The stalks are fairly tall, coarse, and short jointed, the heads heavy, short, and thick, and hang pendant on a short "goose neck." The seed is light yellow and slightly flattened.

Dari is one of the most valuable of the non-saccharine sorghums. It is very coarse in the stalk, and unless cut young the cattle will not eat the stalks, but pull off the leaves and top and trample the stalks under foot. It is one of the most drought-resisting of the sorghums, and revels in dry, hot weather. The yield of seeds is one of the heaviest.

Kaffir Corn is much like the Dhoura. The white variety has a short and stocky stalk, with short joints and very little juice. The leaves are large and numerous. The heads grow erect in large panicles and bear large white seeds, which are excellent for feed, especially for poultry. It suffers comparatively but little injury from winds.

The red variety is somewhat taller, with slender and more juicy stalks; the seeds are red, smaller, and very hard and brittle. It does well on poor land, and ripens a little earlier than the white variety.

In California Kaffir Corn is one of the main sources of feed for poultry.

Millo Maize, of which there are two varieties, yellow and white, are valuable non-saccharine sorghums in localities spared by frost. It is somewhat similar to Kaffir Corn and Dhoura.

It has tall, slender, and juicy stalks, with abundant foliage, and produces a considerable amount of suckers. The heads consist of compact panicles with large seeds. It requires a longer season of growth than Kaffir Corn.

Yield of Seed:—

Variety.	Yield per acre. Bushels of 60lbs.
Yellow Millo	48
Dari	46
White Kaffir Corn	43
Red Kaffir Corn	41
Brown Dhoura	40

III. SACCHARINE SORGHUMS.—Apart from its qualities as a fodder or as a seed-producing crop, some of the sorghums have also for a long time been cultivated for the syrup made from the sweet juice of the plant.

Much improvement has of late years been achieved in that direction in America.

The varieties most widely used for sugar-making were at first Early Amber and Early Orange.

Early Amber, which is also greatly prized for fodder, matures early, and, when grown under favourable conditions, is fairly rich in sugar; but it has small-sized stalks, is delicate, and deteriorates easily, and after maturity rapidly loses its sugar contents if left out in the field.

Early Orange is more sturdy and yields a larger crop, but contains a large per cent. of glucose or uncrystallisable sugar, so that it is better for syrup than for sugar making.

Among varieties which have good results may be mentioned:—"Folger Early," "Collier," "McLean," and "Colman."

IV. BROOM CORN.—A fourth class of sorghum is that which yields the raw material brooms and brushes are made of. This raw material is worth £15 to £30 per ton, according to quality; although much fibre, on the other hand, is of little value, owing to such defects as "Core," which makes the broom stiff and unpliable.

Of the varieties of sorghum grown, those suitable for broom and brush work are considered the hardiest, and they thrive under conditions which the others would not. They yield a small amount of fodder, while the crop of seed harvested would, if fed to pigs and poultry, pretty well pay all the expenses of cultivation of the crop, and leave as a profit 10cwts. to 15cwts. of fibre per acre.

Among the varieties recommended are—

California Yellow, which yields a fibre rich in colour, long, pliable, and light.

Missouri Evergreen yields a large amount of good fibre, and its green colour is a recommendation. Its panicles are branching in the upper portion of their growth, giving to the broom a close, bunch-like appearance, each small branch carrying numerous clusters of fibre to seven seeds.

The *Dwarf* has rather a stunted appearance, and bears its panicles covered by a sheath of the shot blade, being for that reason rather subject to aphis.

BRIDGETOWN DISTRICT.

By G. BUCHANAN.

While a great amount of attention has been directed during recent years to land settlement and the development of agriculture in the Eastern and Southern portions of the State, little has been heard of the immense possibilities of the great area of rich heavily-timbered land lying around Bridgetown. Compared with such agricultural centres as Northam, York, and Katanning, the progress made in the Bridgetown district of late years has been small, but there is little doubt that more substantial headway will be made in the future. It is only within the last six years that this district, which is situated 170 miles from Perth, has had the advantage of direct railway communication. Up to the time the railway was built, little or no attention had been given to the clearing of the land and the cultivation of farm crops; for not only was the distance from market too great to allow of farming operations being conducted profitably, but the initial cost of clearing was so high as to retard people from attempting the cultivation of farm crops on any considerable scale. Prior to the completion of the railway line to Bridgetown, the country was mainly utilised for breeding and fattening stock for market. Even now the cattle-breeding industry is of far more importance to the district than the cultivation of the soil. It is, however, only through the clearing of the land, and the cultivation of the soil that the country can be utilised to its fullest advantage even for stock raising, and the stock the country now carries in its virgin state, would not compare with what may be done when good pastures are established. As the country is all heavily timbered, it follows that the natural herbage is scanty and not over nutritious, but where the land has been cleared a different condition of things obtains. While the more arid districts of the Eastern and Southern parts of the State have proved capable of supplying the local demand for hay, and have nearly overtaken the local requirements for wheat, it is to the more humid localities, such as Bridgetown, with an average rainfall of 30 inches, that we must look to meet our needs in regard to oats, peas, maize, potatoes, and onions. In addition to these commodities, there remains our need for butter, cheese, and bacon, in the production of which the dry districts will never be able to compete with the South-West when the timber has been removed and grasses established. During the past ten years the good prices obtainable for wheat and chaff have been the means of establishing many hundreds of prosperous farmers on the land in the drier parts of the State. The prices for the products the better watered country is capable of growing show an equally fair margin of profit. There is, therefore, no reason why the South-Western districts should not be developed when high prices rule for commodities which the land can produce.

The great barrier to the rapid development of the district lies in the heavy cost of clearing the land. Even where the soil is of first-class quality, and well worth the outlay necessary to bring it under cultivation, the cost is so heavy that the average settler cannot find the cash to clear many acres at a time. It is, therefore, by slow degrees that the country is being brought under the plough. For many reasons this is to be deplored. The prices for the crops this district can produce, are no doubt better now than they will be a decade hence, therefore the cost of clearing can be recouped from the land much more rapidly at the present time than if it is deferred to a later period. Another reason, which affects the general body of the public, is that these products of the soil are badly needed by our local consumers. It is not until the local supply equals the demand that we can hope to obtain the necessaries of life at a reasonable price. When the good land in the South-West is brought under cultivation we can look for cheaper fruit, oats, potatoes, onions, bacon, butter, cheese, and many other lines that can be profitably run in conjunction with the growth of ordinary farm crops. As this country was originally taken up for the purpose of pasturing stock it will in all probability revert principally to that use when cultivation becomes less profitable, and good pastures have been established. The old settlers claim that the country is not now so good for stock as when first taken up. In all likelihood the reason of this is that the good natural grasses have been eaten out, and the continual burning of the country has caused a great amount of scrub and undergrowth to spring into existence, thereby robbing the grasses of nutriment. The firestick, I am aware, is one of the squatters greatest friends, but to be thoroughly beneficial burning-off should follow ring-barking. The burning of green country only tends to aggravate the evil it should abate. The clearing of the country and the growth of sound stock fodder plants will also bring about the extirpation of that troublesome complaint, "the rickets." In localities where the Zamia palm flourishes, this malady causes the cattle owner more loss than all the other complaints to which cattle are subject, put together. When the land is cleared and properly grassed, little fear need be apprehended from the rickets.

Its capacity as a fruit-growing district is the one direction in which the country around Bridgetown has been at all reasonably exploited. The development in this direction is no doubt largely the result of the object lesson in the locality in the shape of Mr. J. Allnutt's orchard at "The Grange." Though this place has gone very much to decay of recent years, it worthily served the turn of an illustration of the capacity of the district for fruit-growing. It is now over 40 years since Mr. Allnutt commenced planting fruit trees at "The Grange." At that time he had no intention to go in extensively for fruit-growing, but, having a fondness for horticultural pursuits, kept adding to his plantation until he found himself the possessor of an orchard of about 30 acres. Of late years the area has been added to, until there is now some 60 acres under trees. In the early days, when this orchard first came into bearing, the great demand which now obtains for fruit did not exist, and the plantation was not then the profitable venture it became in later years. Before the construction of the railway line from Perth to Bunbury the fruit had to be carted by bullock teams from Bridgetown to Bunbury, and shipped from that port to Perth. As it took the teams three weeks to make two trips to Bunbury and back, and the cartage and shipping entailed considerable expense, it will be understood that the profits were not large in those days. Indeed, the balance was sometimes on the wrong side of the account, and Mr. Allnutt refers to one shipment which landed him £3 10s. in debt. The discovery of the goldfields, and the rush of population, and consequent keen demand for fruit which arose, quite altered this state of affairs. With an orchard of 30 acres of apples in full bearing, Mr. Allnutt was the possessor of one of the most paying concerns in the country. I have it on Mr. Allnutt's own authority that the fruit gathered one season realised over £3,000, this being the return for 3,000 cases. As the land on which "The Grange" orchard is planted differs in no essential from the bulk of the soil in the district, it is not surprising that, with such an example as this before their eyes, other landowners should also turn their attention to fruit culture. Where the clearing is heavy and expensive, crops must be grown that will yield a big money return, and fruit-growing promised to satisfy this condition to its fullest extent. The result is that almost every settler in this district has planted a few acres of fruit trees. In the majority of instances the orchards are of fair extent, from five acres upwards. Taking the district which is served by the Bridgetown and Hester's railway stations, there is an area of at least 1,000 acres planted under orchards. These orchards are in a highly satisfactory condition, and give promise of greatly increasing our local supply when they reach maturity. During the year 1902, about 15,000 cases of fruit were dispatched from the two stations mentioned. This shows that only a small percentage of the orchards are yet in bearing, for it averages only 15 cases per acre, or about six pounds of fruit per tree. These figures also show that more money is being put into the fruit culture in this district than is being received in return. Roughly speaking, the value of the fruit sent from this district for 1902 represents about £7 per acre on the area under cultivation. From this it is clear that the bulk of those who have planted orchards have yet to be recouped their outlay.

With the exception of citrus fruits and grapes, all kinds of fruit thrive well in this neighbourhood. It is apples that are grown principally, however, and there is no doubt that apples for export to the old country can be grown just as profitably in the Blackwood district as in Tasmania. There can be no question about the superior quality of the fruit, and with immunity from the dreaded codlin moth, such as this district now enjoys, the prospects of this part of Western Australia eventually entering into competition in the export of apples looks particularly bright. Apart from the question of export, however, our growers have a good distance yet to go before they satisfy the local demand, which the last couple of seasons have proved capable of expanding as the supply increases. It is indeed doubtful whether the area now planted, even when in full bearing, can produce enough to satisfy local requirements. With a constantly increasing population it is, therefore, difficult to estimate what our needs are likely to be a few years hence. Local growers are in a safe position however, even if the necessity to export part of their apple crops should arise within a few years, for the bulk of the orchards have been planted with good keeping and carrying varieties. This applies particularly to the Bridgetown orchards, which have all been planted with the idea that sooner or later a market would have to be sought outside the bounds of the State. The varieties grown most largely are Jonathan, Cleopatra, Dunn's Seedling, Rome Beauty, and Five Crown. The most popular of these appears to be the Jonathan, an apple which has acquired a great reputation in this locality. This variety is a good and early cropper, and, being of a handy size, fine flavour, and beautiful colour, always sells well. Local growers find that no matter how good an apple may be, unless it possesses a rich colour, it will not realise a high price. Such varieties as Cleopatra and Five Crown, though of the finest quality, invariably bring less money than other kinds of a bright colour. The public must in time begin to recognise the different varieties of apples and know their qualities, they will, therefore, not always be deceived by colour, and growers should be careful not to plant largely just to satisfy a whim, which may pass away at any time. Their aim should be to plant kinds that will grow and fruit well, and produce an article that will possess keeping and carrying qualities, and flavour of a high order.

The limits of the space at my disposal will not permit the description of many orchards in the district, but reference to a few may be made. That of Mr. R. E. Warburton, situated about six miles from Bridgetown, is worthy of special mention. Mr. Warburton was successful this and last season in the competition for the cup presented by Sir James Lee Steere for the best kept orchard in the Nelson district. The orchard is prettily situated on the slope of a hill, and is cared for in a most exemplary manner; the cultivation of the soil and the general attention bestowed on the place being far above the average. The orchard is 14 acres in extent, but only six acres are now in bearing; neither can this be considered in full profit, as the oldest trees have only been planted six years. The results obtained from this orchard can only be described as astonishing. Mr. Warburton keeps a complete set of accounts, which show the earnings of the orchard. The profits shown on the orchard account for the season 1902 amounted to £244 8s. This from six acres of trees, varying from three to five years old, is not bad, especially when it is taken into consideration that the account was charged with the expense of attending to the newer part of the orchard, as well as the cost of the additional plantation made during the season. The trees in this orchard have the reputation of being abnormally prolific, and the crop they were carrying at the time of my visit quite justifies the character. Practically the whole area is planted with apples, the varieties grown being Jonathan, Cleopatra, Dunn's Seedling, Rome Beauty, Reinette du Canada, Adam's Pearmain, and Cox's Orange Pippin. All these kinds do remarkably well and fruit heavily. Last year nine five-year-old Cleopatra apple trees yielded 81 cases of marketable fruit. A feature of the fruit from this place is its exceptionally fine colour, which causes it to be very much sought after by buyers.

Mr. H. Doust has an orchard of about 17 acres in extent, about a mile from the town. Part of this property has been planted 11 years, which portion is now in full bearing and yielding heavy crops. Last year over 18 tons of apples were gathered, and realised over £500. This return was received principally from about six acres of ten-year old trees, very little fruit being harvested from the younger portion of the orchard. Though apples are grown principally in this orchard, there are enough of other kinds of fruits to prove that it is not the apple alone that is particularly adapted to the district. The pears grown by Mr. Doust are of the highest quality. Some exhibited by him at the Bridgetown Show in March were described by the judges as the finest seen by them in the State. These were of the Bartlett variety, of large size, three of them turning the scale at two pounds eleven ounces, and splendid quality and colour.

Another place that is an example of what can be done by untiring energy and perseverance, is the property occupied by Mr. Lawrence Lynam, situated about three miles from Bridgetown. This property contains 300 acres, of which 200 acres are cleared. About 100 acres are cropped yearly with oats and wheat, the crop being harvested for hay. It is to the orchard and garden of about seven acres that Mr. Lynam devotes most of his attention, with the result that it is one of the best kept in the district. Vegetables of all kinds are grown, for which a ready market is found in the township. Mr. Lynam also takes a keen interest in experimenting with new seeds and kinds of vegetables, cereals, and fodder plant. His display of the latter at the Show recently held in Bridgetown would prove to the most sceptical that summer fodder for stock can be profitably grown in this district.

The expansion of the fruit-growing industry has made this district a happy hunting ground for nurserymen and their agents. Recognising the future before fruit culture in this locality, Mr. J. Hawter decided about three years ago to establish a nursery in the district, from which local growers now have the advantage of being able to obtain trees that are thoroughly acclimatised. Mr. Hawter's orchard and nursery, which cover an area of 120 acres, are most picturesquely situated close to the Mullalyup railway station. There is a splendid assortment of fine strong young stocks now in the nursery ready to go out this season. Mr. Hawter estimates he has over 100,000 young trees ready for this season's planting. This nursery has the advantage of being situated in a district where the risk of contamination from disease is remote, and the stock is now, and has always been, quite free from any injurious pests. Mr. Hawter shows his faith in the prospects of the fruit-growing business by planting extensively himself. Already he has over 100 acres under trees, and he purposes adding 30 acres more this season. Unlike most places in this district, pears and peaches have been planted more largely than apples. These trees are making splendid headway, the young peaches in particular having developed into very fine trees, and have already—though only two seasons planted—yielded fair crops of fruit.

The land on which this orchard and nursery is established was originally timbered very heavily, and the clearing has been a very heavy task. The cost, however, does not seem excessive, for Mr. Hawter estimates the expense at between £7 and £8 per acre, a sum much less than clearing of this land usually costs. Mr. Hawter, in common with other up-to-date settlers, has found the use of gelignite and dynamite of the greatest assistance in removing timber from the land. These explosives are fairly cheap, and a few plugs placed in a log or tree, are found to shatter the timber to such an extent that a fire soon demolishes the lot. The skilled use of these powerful explosives has been found to reduce the cost of clearing by quite half what the same work would cost if done without their aid. If the cost of clearing can be still further reduced, there are immense possibilities awaiting this district.

THE TENTH ANNUAL PRODUCERS' CONFERENCE.

On Tuesday, 24th March, the Tenth Annual Conference of the producers of the State was held in the Agricultural Department's Museum, Mr. W. Paterson, Director of Agriculture, presiding. Some 50 delegates had gathered from all parts of the State, and, collectively, they represented the Pastoral, Agricultural, Vine, Fruitgrowers', Botanical, Poultry and Bee-keepers' Associations of Western Australia. The Premier, Mr. Walter James, K.C., M.L.A., the Minister for Lands (Mr. J. M. Hopkins, M.L.A.), Messrs. Chas. Harper and M. J. Jacoby, M.'sL.A., were also present.

We are indebted to the *West Australian* for the following report:—

THE PREMIER'S SPEECH.

On rising to deliver the inaugural speech, the Premier (Mr. Walter James), who was received with applause, said:—"I have to extend to your chairman my thanks for the opportunity of saying a few words in relation to the industry in which you are all workers, and upon which so much of our prosperity depends. These inaugural addresses are apt to become didactic, and the speaker inclined —no doubt insensibly—to preach homilies. Many of you must smile in such cases at the frequency with which the world witnesses the spectacle of the old lady being taught to suck eggs. I shall endeavour to avoid furnishing such a spectacle, because I am fully confident in your wider experience and more practical knowledge. If I fail, however, you must remember that agriculture is in every country receiving an ever-increasing amount of attention. The application to the land of those business methods and that scientific research which have built up the greatness of every other industry has resulted in such an astonishing increase of agricultural productiveness that a truer view is being taken of the wealth which lies in the soil of every State, and, as a consequence, the importance to a State of the full development of its soil is becoming more and more impressed upon every public man. Under such circumstances suggestions should be pardoned, as indicating an appreciation, rather than resented as covering a censure. It is no doubt true that in the past

The Vocation of an Agriculturist

Tended to conservative methods in work and conservative views in development. That was so, not so much on account of the industry itself, but because of its age and its past isolation. It is not peculiar to agriculture; we see the same result manifested in other industries as they grow in years, and become forgetful of competitors. We even hear complaints of the conservative and independent habits of English manufacturers after their long reign of undisputed supremacy, during which they were never challenged by real competition. The more modern methods which are transforming agriculture are, I believe, largely due to the competition which recent modes of transport have alone rendered possible; and following on that competition has come development after development, which not only enables competition to be fought and overcome, but gives to the common wealth of the State an ever-increasing proportion garneied from the soil. The agriculturist of to-day succeeds only to the extent to which he appreciates how little the earth is prepared to yield to the man who imagines that, because the earth is old, its methods of cultivation remain unaltered. The successful farmer is the man 'who woos the earth' by the application of modern business methods; who knows that his stock-in-trade must be kept up-to-date in order to meet the changing demands of his customers and the variations of his market. And, as he has to fight the world, he wisely profits from the experience of this world. Here in Western Australia, until gold attracted to us our population and made for our farmers a local market, the condition of agriculture warranted no progressive policy, and certainly held out no inducements to adopt such a policy. The isolation which surrounded us, and the large area of our State, made progress almost impossible.

Our Oldest Settlers

had to fight the hardest fight of all, because it was a constant and heartbreaking struggle, with little, if any, of that hope which sweetens all labour. They fought that fight in a manner which makes us their debtors, but they have, in too few cases, reaped the reward of to-day. It is to our new generation of farmers that, on the whole, we owe the best agricultural work to-day, and we shall all with pleasure admit that newer men and newer methods have transfused new life into somewhat lethargic veins. This very fact—that our agricultural development is but just beginning—will, in the course of a few years, prove our greatest blessing by ensuring that our agricultural population, being young and ignorant, bringing to our shores an experience gathered at heavy cost elsewhere, make the agriculture of Western Australia the most up-to-date and progressive in Australia.

The Year that has passed

since your last conference has no more pleasing facts for Western Australia than its record of our mining development, and of our enlarged mining and agricultural prosperity. The output of gold to the end of last month (February) was 9,209,758ozs., amounting in value to £39,120,565. It exceeded that of all the other States of the Commonwealth put together, and almost equalled the entire output of the rest of Australasia. As showing how much we depend upon the direct products of Mother Earth, I should point out that in 1902, in addition to our gold and agricultural productions, we exported timber and sandalwood to the value of £562,304; we produced wine to the value of about £45,000; and the sea yielded us an export of pearls and shells valued at £178,699. The year 1902 witnessed the following

Dealings in the Lands Department:—

Applications approved during year: Conditional purchases, etc., including grazing and poison leases, 2,483; pastoral and other leases, 1,335; town, suburban, and rural lots, 1,454; total, 5,272. The total number of holdings dealt with during the year, exclusive of rejected and pending applications, was 21,301. The area granted under C.P., etc., during the year, including grazing and poison leases, was 548,898 acres; pastoral leases, etc., 23,775,642 acres. The revenue for the year was £150,405 3s. 1d., and the expenditure £62,519 9s. 8d. It is to be borne in mind that this revenue includes the repayment of purchase moneys on sales of fees simple and conditional purchases. The following figures show the transactions at the Lands Office for the first two months of the present year:—Conditional alienation: Conditional purchases, 63,886 acres; free homestead farms, 29,771 acres; grazing leases, 50,841 acres; selections under Land Purchase Act, 452 acres; poison land leases, 3,256 acres; total, 148,206 acres. Leases and licenses: Pastoral leases, 3,494,200 acres; pastoral licenses, 3,473 acres; special leases, 46 acres; timber leases, 14,080 acres; total, 3,511,799. Then, to the end of February last, we have the total

Yield of the Principal Crops

as follows:—Wheat, 956,886 bushels; maize, 5,203 bushels; oats, 163,654 bushels; barley, 34,723 bushels; rye, 2,933 bushels; dry beans, 128 bushels; dry peas, 3,777 bushels; hay of all kinds, 89,729 tons; potatoes, 5,739 tons; onions, 377 tons; all other root crops, 390 tons; wine, 185,735 gallons.

The Average Yield

per acre of principal crops was:—Wheat, 10·10 bushels per acre; maize, 10·16 bushels per acre; oats, 16·78 bushels per acre; barley, 13·01 bushels per acre; rye, 7·94 bushels per acre; dry beans, 6·73 bushels per acre; dry peas, 11·44 bushels per acre; hay of all kinds, 0·97 tons per acre; potatoes, 3·14 tons per acre; onions, 2·30 tons per acre; all other root crops, 3·02 tons per acre. Since the

Land Purchase Board

was constituted, four or five years ago, the Government have repurchased land for purposes of closer settlement to the extent of slightly over 71,000 acres in different portions of the agricultural area. The price amounted to a trifle more than £1 per acre. The grant of so great an acreage under

Pastoral Lease

of which no less than 9,357,000 acres are within the pastoral country recently discovered by Mr. Brockman, shows that the pastoral industry is progressing side by side with that of agriculture.

The Position of our Land Settlement.

at 28th February last was as follows:—Land absolutely alienated by auction, completed selection and otherwise, including 666,910 acres to Midland Company, 3,530,117 acres; land held under conditional purchase and other forms of tenure (to be ultimately alienated), 3,568,326 acres; land granted to Midland Company (Crown grants not issued), 2,768,810 acres; total alienated or in process of alienation, 9,867,253 acres; land held under pastoral lease, etc., 111,211,139 acres; January to February transactions, 3,511,799 acres; land neither sold nor leased, 499,998,609 acres; total area of State, 624,588,000 acres. Our

Land under Cultivation

is as follows:—Grain crops, 108,360 acres; hay, 92,654 acres; root crops, 6,722 acres; vines and fruit trees, 9,705 acres; total, 217,441 acres, giving an average of about 1·1 per head of population in acres, almost double what it was in 1897, grain crops having increased from 35,515 acres to 108,360 acres, and vines and fruit trees from 4,687 to 9,705.

Our Stock

at the end of 1901 were:—Cattle, 398,547; sheep, 2,625,855; horses, 73,710. Our export of wool has increased from £295,646 in 1897 to £458,078 in 1902. These figures indicate in a most striking manner the development that has been taking place, and the encouragement to be derived is greater when it is remembered that the rate of progress increases with each year, as new settler is added to new settler, and as those already with us add acre upon acre to the plough and cultivator. I have not referred to

Prices for Produce;

they speak for themselves, but I cannot refrain from mentioning a case, by way of illustration. I heard of one energetic farmer who cropped 900 tons of hay from 600 acres, and refused £5,000 for the crop. Such instances must, however, be rare, and I should be sorry if an agricultural community expected a continuance of such instances in years to come. The prosperous times of to-day cannot last for ever, and as the years go on, a pound will need more earning. It will be found, as the years pass by, that the successful men will prove to be those who are to-day putting back into the soil as much as possible of what they are now making out of it. We are bidden to make hay while the sun shines. All endeavour to do so. But the wise man is he who appreciates that the haymaking sun does not always shine, and who prepares for the time when other suns shine, and other wants arise.

The Future of this State

lies in its cereals and its fruit; we shall export both in large quantities, but in the meantime, we are urgently called upon to supply our own immediate wants. To talk of export does seem a far cry, when we realise the capacity of

Our own Home Market.

Our great mining industry moves steadily ahead, and our timber industry is better organised and more prosperous; our population is increasing; and, while every day adds to the farmer's market, every day also tends to make that market more steady and permanent. But, even if the market remains stationary, we are yet a long way from being able to adequately supply that market, so that no undue anxiety should exist about the increased market of to-morrow. Our importations for the year 1902 were as follow:—Agricultural produce, £506,589; fruit and vegetables, £137,126; live stock, £277,561; farm and dairy produce, £762,855; wines, £32,998; total, £1,717,129. It is interesting to note that our wine production amounts to about two-thirds of our consumption; but the total removal of the sliding scale may affect this. Until this enormous importation is considerably reduced, there is no need for the agriculturist to have any apprehension as to the future. There is shown to be a market to be exploited by energy and perseverance. The only lesson to be taken to heart is, that energy and initiative are absolutely requisite. The returns, however, emphasise

Two Lessons—

(1) That the local demand for hay and chaff is now practically met by local supplies, and that old prices cannot for long be maintained; (2) that the class of goods imported cannot be produced locally, unless farmers appreciate that internal competition in regard to hay and chaff tends to make the other lines more worth capturing, though involving more trouble. The men who first start these other lines will reap the best profit. These lessons are well known to every farmer; they have been told them

so often that no person could have failed to have heard them repeated. I am glad to know that in a great many instances the lessons are being applied. Whether their importance and the imperative need of immediate and thorough application of those lessons is sufficiently impressed upon the minds of the great majority of the producers, is open to doubt. I do not want to lecture on the necessity for

Mixed Farming;

more practical men than I are always doing that; and, moreover, the too great tendency to over-produce any one line will soon work out its own cure, at the expense of those who will only learn at their own bitter cost. But I want to refer to one or two sidelines which are so valuable, and yet so easily within the reach of all, that they should be treated as an inseparable part of every farm, whether "mixed" or not. Last year we paid £56,000 for

Eggs Imported.

Now, the imported egg is not the freshest, and its consumption, therefore, by no means represents the capacity of the market. There is absolutely no reason why this State should not produce all the poultry and eggs it consumes. To attain that end only one fact needs to be appreciated, namely, that poultry-raising demands attention and a certain amount of knowledge; it must be treated as a business, and not as a mere casual matter, controlled by the whims of the birds themselves. You can depend upon it that no product is valuable which does not involve both time and trouble in the production.

If Poultry-Raising

were merely a matter of purchasing fowls and collecting the resultant eggs, then poultry products would have no value. But, though this be true, it is also true that there lies at the hand of every farmer no more certain means of aiding his income than by the adoption of poultry-raising, on however limited a scale. That there is an absolute and general want of knowledge on the subject is apparent; and I hope that Mr. Patterson will succeed in his determination to successfully impress the value of this sideline on every producer. In America the industry has reached enormous dimensions. The census in 1900 disclosed the fact that the annual value of poultry raised was 136,891,877 dollars, and the annual value of eggs produced was 144,286,158 dollars. Nor was this result due to mere poultry farms devoted to this line exclusively, inasmuch as out of 5,739,657 farms, no less than 5,096,252 gave returns as to poultry kept. In some States poultry provides the farmer with the necessaries of life, and the development of the trade shows how promptly and keenly the American farmer grasps the fact that the surest profits are derivable from those branches of farming which cater for the cheap necessities of the people. If such results follow in America, what an opening there is in Western Australia for those who take the matter up promptly and energetically, while prices stand at their present high figures. The other sideline to which I desire to refer is that of

Bee-keeping.

On more than one occasion this subject has been elaborated at these conferences. I refer to it now, just as a reminder and to express the strong hope that you will aid the efforts of the Government and show some practical results from the work of Mr. Sutton. In America, about one farm in nine keeps bees, and the annual production of wax and honey amounts to 6,664,904 dollars. California stands fifth on the list, and occupies that position very largely by reason of its climate and flora. In many respects we enjoy a similar climate and a prolific flora, as well as very much the same rainfall; and no American State is better worth studying by the Western Australian farmer. Its rivers and its adaptability to irrigation we cannot equal, but in other respects it offers lessons to us which are well worth the study. That matter of irrigation leads me to the subject of

Water Conservation

as being the most vital topic for the consideration of the agricultural community; so vital, indeed, that one would expect the matter to be one constantly engaging their attention. It is discouraging to find so little done; to find that, despite the annually-proved value of the water, so little surface conservation is attempted. There is no subject upon which so much is talked about the duty of the Government, when so much could be done by the simple application of the plough and scoop. A surface supply is within the easy reach of every settler, and the Government gives assistance through the Agricultural Bank, so as to enable this supply to be obtained. It should in every case be almost, if not quite, the first work to be done; and the instances in the various districts of successful work in this connection should be quite sufficient to convince the most indolent. The Government would more readily and earnestly approach the consideration of general schemes if it found the individual farmer alive to the importance of water conservation and giving practical proof of the fact. No body of men who can aid in the removal of a difficulty have any right to come for Government aid until they have to some extent helped themselves. With water conservation, individual effort is absolutely essential, even to the success of a Government scheme. Some more general evidence of that individual self-help is urgently needed. The State should help those who are first prepared to help themselves. It cannot constitute itself a convenient post to be leaned against by every tired farmer who, in time of dry seasons, curses the Government and prays for rain, instead of cursing his own short-sightedness and praying for more relf-reliance.

The Government

should, and will, push on with boring, and, in connection with grouped areas of settlement, see what can be done by tank-sinking and conservation. But the best and greatest State efforts cannot be made—will not be entertained by Parliament—unless, and until each dry-country farmer gives proof, by practical demonstration, that he values water conservation. The ever-increasing appreciation of the value of fertilisers suggests to me that, perhaps, the provisions of

"The Fertilisers and Feeding Stuffs Act, 1895,"

are not so well known as they should be. That Act was passed to ensure the quality of fertilisers, and provides a remedy by which the purchaser can be protected from fraud. Since the Act came into force, over £100,000 worth of manures have been imported; but not one penny has been spent by the farmers to test these manures, and thus guarantee that the article is what it is represented to be. I cannot believe that all these manures are what is claimed for them, and I draw the attention of the conference to the matter. Another matter to which attention should be drawn is the question of dealing with

Kimberley Cattle,

and the existing tick regulations. The matter is one of importance as affecting—(1.) The supply of breeding cattle and stores to the South-West; and (2.) the stocking of the new country at Kimberley discovered by Mr. Brockman. It is of great importance that our farmers should be encouraged to breed and fatten cattle, and that every inducement should be held out to secure this end. It is of equal importance that the new Kimberley country should be stocked from the best available source of supply. As to the first question, a great deal depends upon the extent to which the farmers of the South-Western districts would avail themselves of the opportunity of purchasing cattle. The experience of Queensland appears to be most strongly in favour of a double dipping as a safeguard which can be absolutely relied upon, and my own opinion is that we should allow the introduction of cattle for local purposes subject to a double dipping. The matter, however, is complicated by the existence in our midst of two bodies of opinion equally uncompromising and equally influential; the one body that would allow no admissions under any conditions, and the other, which is not so alarmist, and would admit cattle, if dipped. The question is worth your consideration, and will, I hope, be discussed. The question of stocking the new Kimberley country is another aspect of the same question, and opinions are equally conflicting. The tick boundary is an imaginary line at present, and I am not prepared to admit that its position exercises so charmed an influence that its alteration would be disastrous. That it should be altered is, I think, clear; but where the new line should run is a difficulty which is not capable of a solution which all parties will readily accept. These and other matters will no doubt arise for discussion, and the Minister for Lands desires to attend your meetings, not only to hear your views, but to present you with any data which will enable your resolutions to be based upon a full knowledge of the facts of each case. The Government is anxious to make these conferences an effective

Parliament of Producers,

whose deliberations shall be impressed with a due sense of responsibility, and whose resolutions shall carry corresponding weight and authority. You will ask

What has the Government been doing

to assist the agricultural industry, which is of such great and permanent value to the State—an industry which is being, day by day, more clearly recognised in every country as of enormous and ever-expanding value. Well, let me tell you. We are going to attract as many settlers as possible, because we believe no other State offers so many advantages. This State has

Never Experienced a Drought

during the course of its 70 years' settlement. That fact is unique in Australia, and is bound to exercise an enormous influence in our favour. Our rainfall is ample; and, even in our driest cereal country, Nature is kind enough, if we but lend our assistance.

The Insect Pests Act,

which has made Western Australia the cleanest State in the Commonwealth, and which is being copied in the Eastern States, must be fully and properly administered, and more care must be taken to guard against the introduction of disease. At the same time, those diseases which have appeared must be checked, if not stamped out. Mr. Compere, our entomologist, is now endeavouring to find the parasite for the fruit fly; he is now in America, and will subsequently visit the Mediterranean. His trip will, it is hoped, result in ridding us of a pest a hundredfold worse than the codlin moth. The Government intends to make more liberal provision for

Roads in Agricultural Districts,

but at the same time will insist on local taxation, under the new Roads Board Act. By means of the practical lectures and demonstrations of travelling inspectors, the Government intends to improve

Technical Education in Agriculture,

and, by setting aside small plots of land in various districts, will provide practical illustration within easy reach of the farmers of those districts of what the soil is capable, what crops and grasses best suit it, and what fertilisers produce the best results. The Government intends that its

Minister for Lands shall be in touch

with the agricultural community, and not tied at all times to his office chair; that he shall come into direct contact with the farmers he desires to serve, and be thus able the better to appreciate their real wants. The Government has requested the Commissioner of Railways to meet you on

The Question of Rates.

We are as anxious as he is to prevent any charge operating as a penalty against you. If you have a good case you may depend upon a sympathetic consideration. The Government has already extended the operations of the

Agricultural Bank Act,

but care will be taken not to extend those operations unduly. Within the limits of the present scope of the Bank, whatever money is required will be found. The Agricultural Bank has not yet met a refusal in that direction. Lastly, the Government intends that every farmer in the State shall not, all the time,

Lean on the Government.

Its duty is, by all means, to encourage and stimulate the industry. It is also its duty to encourage self-help. The present prosperous financial times must not be looked upon as permanent. Whilst money is available, it cannot be put to a better and more permanently useful purpose than to settle the lands of the State and to assist settlers. The Government, however, will merely waste their money unless the farmers appreciate the efforts that are being made, and unless they, by reciprocal effort guarantee that every pound expended produces twenty shillings of benefit to the State. Every body of men and women have an idea that the State has limitless money to expend and but few objects to spend it on. The Government is appealed to without any effort being made to limit the appeal to necessary works—in truth, a feeling of resentment if the appeal is not granted. A feeling is growing up that the Government should do everything, and your agenda paper gives evidence of what you want the Government to do rather than what you intend to do yourselves. Don't imagine that our revenue can remain as large as it is, and can always be devoted to the same purposes. There are not wanting signs that revenue will have to be called upon to do works which, in the past, have been done out of loan. Our loan expenditure will need closer scrutiny. You cannot expect a continuation of so much Government help indefinitely. Western Australia to-day pays

More Attention to her Farmers,

and does more to meet their needs, than any other State in the Commonwealth. I am glad of that fact, as no body of men deserves better of the State. We shall continue to help in every way possible, because we look upon your work as resulting in profit to the State. But do not always cry for more; make an effort to limit your requests to those matters only which are necessary and urgent; and, whilst anxious to push forward your own industry, do not overlook the heavy demands made upon the revenue from all parts of this State. (Applause.)

The Minister for Lands, who had returned that day from his trip through the South-Eastern district, admitted that the office under his administration was beset with problems of far-reaching importance. Problems that, without the assistance of the efficient officers at his disposal, and, indeed, of the producers themselves, he felt he would be incapable of satisfactorily solving. Granted that assistance, however, he thought he could establish a very fair record. (Hear, hear.) From his knowledge of the conditions, he was convinced that the resources of the State could be systematically and efficiently developed only by the liberal policy of roads and railways. (Applause.) Since becoming a member of Parliament he had not known a single member of the Assembly prepared to champion the local Lands Office. Yet he doubted if there was any other department that could do more for the country. The enormous amount of imports referred to by the Premier was ample indication that the present producers of the State were not going to overtake local requirements. On the other hand, the monthly returns went to show the great stability and ever-increasing development of both the mining and agricultural industries of the State. It was his intention to be present as much as possible during the sitting, when he would be pleased to hear of and consider their requirements.

On the motion of the Chairman, a vote of thanks to the Ministers was carried by acclamation, and the Conference proceeded to the consideration of the agenda paper.

BUSINESS OF THE CONFERENCE.

Government Subsidy.

Mr. J. Duce (Wellington) moved, and Mr. S. Layman (Wonnerup) seconded—"That in the opinion of this Conference the Government subsidy to agricultural societies be increased to 10s. in the £ on the amount of prize money actually paid away each year."

Mr. T. Norrish (Great Southern District) moved, and Mr. J. C. H. Nenke (Wagin-Arthur) seconded, as an amendment—"That in the opinion of this Conference the Government should subsidise societies on the basis of subscriptions, instead of the prize money, at the rate at 10s. in the £."

The resolution was carried.

Grants to Poultry Societies.

Mr. N. Hall (Goldfields) moved, and Mr. M. J. Quirk (Denmark) seconded—"That it is a recommendation from this meeting to the State Ministers that the annual grant which has in the past been given to poultry societies be re-instated, and that last year's grant be made available."

Mr. Nenke moved, and Mr. S. Williams (Beverley) seconded, as an amendment—"That the subsidy be paid on the same basis as that of the agricultural societies on poultry items only."

The amendment was carried.

Second-hand Fruit Cases.

Mr. J. S. Park (South-West, Central) moved, and Mr. Nenke seconded—"That in the opinion of this Conference the use of second-hand fruit cases be absolutely prohibited."

Mr. J. H. Stone (West Swan P.A.) moved, and Mr. O. Bull seconded, as an amendment—"That in the opinion of this Conference the use of second-hand fruit cases be permitted after having been disinfected, and that disinfecting chambers for this purpose be erected at Perth, Southern Cross, and Geraldton."

The resolution was carried.

PROTECTION OF FRUIT.

Mr. Norrish moved, and Mr. Nenke seconded—"That, in the opinion of this Conference, steps be taken to prohibit merchants and others storing shooks in the same portion of the building as fruit exhibited for sale."

The resolution was carried.

USE OF FERTILISERS.

Mr. A. C. Morrell (Jennapullen A.S.) moved, and Mr. S. Williams seconded—"That, in the opinion of this Conference, to enable producers to obtain the best results from the use of fertilisers, experiments should be tried in different parts of the State with the various sorts of fertilisers, and the results be published in the *Journal* of the Department of Agriculture, and other papers."

In the discussion following this motion, the chairman announced that the Department of Agriculture, intended to experiment in every district with fertilisers and manures.

On this assurance, the motion was withdrawn.

Mr. M. Brown (Narrogin-Williams) moved, and Mr. W. G. Ash (Harvey A.A.) seconded—"That, in the opinion of this Conference, all importers and manufacturers of artificial manures be registered as such; that purchasers be given Government certificates of analyses, and that inspectors be appointed by the Government to protect the interests of the consumer."

As an amendment to this, Mr. J. H. Stone (West Swan P.A.) moved—"That, in the opinion of this Conference, the Fertilisers and Feeding Stuffs Act of this State be amended to correspond with the South Australian Fertilisers Act."

The Chairman admitted that he entirely agreed in the opinion that the South Australian Fertilisers Act was superior to that in force in Western Australia.

After further discussion, it was decided to appoint a sub-committee to consider the whole question, and report at the next sitting of the Conference. Messrs. Morrell, Brown, Stone, Cailes, Jull, Hammersley, and Stone were appointed as the committee.

The Conference adjourned at a quarter to 6, until half-past 9 o'clock on the following morning.

SECOND DAY.

USE OF FERTILISERS.

Immediately prior to the previous day's adjournment, a committee was appointed to consider the amending of the Fertilisers and Feeding Stuffs Act to correspond with the South Australian Act. The committee reported having passed, as a recommendation to the Conference—"That, in the opinion of this Conference, the Fertilisers and Feeding Stuffs Act should be amended in the direction of the South Australian Act, with the addition that the Government should undertake the analyses of samples of each and every shipment in bulk; also, all that is manufactured in this State."

The chairman of the committee (Mr. Gell) pointed out that the chief difference between the South Australian and the proposed Act was that in the neighbouring State the Act was merely permissive, whereas his committee proposed to make the new legislation imperative.

The recommendation was adopted.

NOXIOUS WEEDS ACT.

Mr. O. Bull (Deepdale) moved—"That, in the opinion of this Conference, the Noxious Weeds Act be so amended that the seat of the difficulty at Midland Junction be dealt with before the law is put in force in districts adjoining same." He was not altogether in favour of the principle involved; yet he agreed that the district named should be forced into action.

Mr. A. Sanderson (Darling Range) thought it was the administration, rather than the Act, that was weak.

Mr. Gell moved, as an amendment—"That the Government be respectfully requested to provide sufficient funds to carry out the Noxious Weeds Act."

The amendment was carried.

INSECT PESTS.

Mr. Sanderson moved, and Mr. W. E. Ash (Harvey) seconded —"That, in the opinion of this Conference, the Department of Agriculture should prepare and distribute to the fruitgrowing associations, on application, specimens and coloured plates of the various insect pests which are known to exist in this State." The idea his association had in mind was to make their local hall a miniature museum, for the purpose of disseminating information.

Mr. Despeissis (viticultural expert) said that the matter had been before his Department, and something would doubtless be done in the direction indicated. Meanwhile, they would do well to study the second edition of the Department's handbook on horticulture and viticulture, containing an illustrated chapter on insect pests.

The resolution was carried.

THE TICK PEST.

Mr. A. R. Richardson brought up the matter of the tick pest. He spoke of the past inadequate quarantine regulations at Fremantle, where there was no neutral belt at the boundaries, and whence cattle had been known to escape. The fact that after five or six years of this state of affairs they had not yet had difficulty with the pest went to show that the conditions were unfavourable to its spread. In view of this, he deprecated the prohibitive tick regulations. Would it not be better for the graziers in the South-West district that they should have access to a fair supply of store stock than that their pasturages should in part remain useless? In Western Australia they had the second largest supply of cattle in the Commonwealth; yet, at the same time, the highest prices ruled. Something was palpably wrong. A large dealer in East Kimberley had told him that but for the tick regulations his district could supply all the store cattle needed by graziers in the South-West. In Queensland it had been found that dipping the cattle was a certain preventive. He moved—(*a*.) "That in view of the great scarcity and high prices ruling in this State for butchers' meat, and the very limited supply and high prices obtaining for store cattle, it is extremely important that all unnecessary restrictions curtailing the supply of store stock available to graziers and agriculturists, and of fattening cattle for the metropolitan and goldfields markets, should be at once removed; and (*b*.) this Conference is, therefore, of opinion (provided the Chief Inspector of Stock is satisfied that after two or more dippings any tick-infested East Kimberley cattle landed at Fremantle are free from tick, and, therefore, clean, and that no serious risks to clean herds would ensue from their distribution in the State south of the 29th parallel of latitude) that the Governor-in-Council should at once authorise such amendments of the present tick cattle regulations as will permit East Kimberley cattle being so distributed."

Mr. W. E. Ash (Harvey) seconded the motion.

Mr. Sanderson thought the case so apparently fair that he could not understand what had been the difficulties in the past.

Mr. Richardson: Entirely a difficulty of the pocket.

Mr. Gell said that it was impossible for an independent man to get freight on the boats for the purpose of bringing cattle down. The freights were monopolised for 12 months in advance.

Mr. Duce (Wellington) moved, and W. J. Bryant (Coogee) seconded, as an amendment—"That the question be referred to a select committee having a practical knowledge of the subject."

Mr. J. C. H. Nenke (Wagin-Arthur) said that there were in his district large areas of pasturage on which there was not a single beast.

The amendment was lost, and the resolution carried.

THE CODLIN MOTH.

Mr. T. Ilbury (Wooroloo) moved, and Mr. Souness (Mount Barker) seconded—"That, in the opinion of this Conference, 'The Insect Pests Amendment Act, 1898,' be so amended as to absolutely prohibit the further introduction of apples, pears, and quinces into Western Australia."

Mr. Souness held that the Government inspection was so inadequate that the country was fast becoming infested with the pest. The motion would entail a little hardship for a time, but this would, in the long run, be amply compensated.

Mr. G. Willis (Jandakot) declared that the evil was on the increase.

Mr. Sanderson thought it was absolutely futile for the Conference to attempt to prohibit the importation of fruit. With regard to the inspection, he could say, from experience, that the Department at Fremantle was ever ready to destroy any fruit bearing suspicious features. He moved, as an amendment--"That, in the opinion of this Conference, the Insect Pests Act Amendment Act be strictly enforced, and every precaution possible be taken to prevent the introduction of the codlin moth."

The amendment found no seconder.

Mr. Bull submitted that no system of human inspection could prevent the codlin moth widely spreading from imported fruit. It was erroneous to think that the passing of the resolution would enhance the price of fruit, for the local supply was increasing rapidly.

Mr. J. S. Park (South-West, Central), as a fruitgrower of 30 years' standing, believed that the local supply would overtake the demand within two years.

The resolution was carried; and it was resolved that those present form a deputation to wait upon the Premier, with a view to bringing it under his notice.

SAN JOSE SCALE.

Mr. T. James (Kelmscott and Armadale) moved--"That, in the opinion of this Conference, considering the difficulties of fumigation in dealing with the San Jose scale, the Department of Agriculture be urged to endeavour to find some more simple remedy." He held that West Australians were the only people who fumigated for San Jose scale. Spraying had met with far better results at much less expenditure.

Mr. Bull seconded the resolution. He thought the Department should be asked to make inquiries into the merits of the two systems of eradication.

Mr. T. Norrish (Great Southern) held that fumigation was effective—it had killed both scale and trees in his orchard.

Mr. A. E. Dugden (Brunswick) had found fumigation in every way satisfactory.

Mr. Ash advocated the paying of greater attention to the native parasites for the checking of the pest.

Mr. Despeissis said there were 3,000 registered orchards in the State, of which less than 100 were infected, and some of those only slightly so. The present system was the best eradicator known to experts, and yielded better results than did spraying. He thought the better policy would be to go on with the fumigation. He did not think the Department could be accused of harshness in the administration of the Act.

The resolution was carried.

AGRICULTURAL BANK ACT.

Mr. Bull moved—"That, in the opinion of this Conference, the operations of the Agricultural Bank having in the past been so eminently successful, its operation might be very largely extended; and the Conference asks for the further extension to £500,000, instead of the present amount placed at the disposal of the Bank." The Bank had not cost the State one shilling, and had been of wide-reaching benefit to farmers. The present capital of the Bank was £300,000.

Mr. James seconded the motion.

Mr. Saunderson thought they should keep a watchful eye on these financial resolutions. It was all very well to say the Bank had not cost the State anything; yet the State would have to find the amount asked for.

The Chairman explained that as, from time to time, the Bank had required money, it had been readily granted by Parliament.

The resolution was withdrawn.

Mr. W. J. Ecclestone (Boyanup) moved, and Mr. Ash seconded—"That, in the opinion of this Conference, the Agricultural Bank Act, 1902, be so amended that the whole of the money advanced may be employed in paying off liabilities."

Mr. Harper, M.L.A., felt confident that it would be wasting time to ask for any liberalising of the Act until it had been proved in its present form.

On the suggestion of Mr. Gell, the motion was withdrawn.

AGRICULTURAL COLLEGES.

Mr. Ash moved—"That, in the opinion of this Conference, the time has arrived when it is expedient for the Government of this State to equip an agricultural college on the central experimental farm for the education of farmers' sons and others in the science, art, and business of the various branches of farming, and, further, that an experienced professor of agriculture should be obtained at once to direct the establishment of the college farm." It was high time they should give their young men the advantages existing in the other States. No progressive State should be without such an institution as that proposed.

Mr. J. Mowforth (Albany) seconded the motion.

Mr. Duce moved, as an amendment—"That, pending conditions favourable to the establishment of an agricultural college in this State, the Government be recommended to offer subsidies to the sons of settlers attending any of the recognised agricultural colleges in Australia, conditionally upon the recipients of such subsidies subsequently settling on the land in this State." There was but a small proportion of the farmers who could afford to let their sons give the time to attend a college, which, after all, would require at least 200 students to make it self-supporting. More than 25 students could not be reckoned on.

Mr. W. J. Ecclestone (Boyanup) seconded the amendment.

Mr. Sanderson deprecated the passing of resolutions that would have no chance of being accepted by the Government. He thought they should seek to get assistance from the primary schools, rather than attempt the establishment of a new and expensive college.

As a further amendment, Mr. Brown (Narrogin-Williams) moved—"That, in the opinion of this Conference, it is desirable that the Government gives further assistance to the experimental farms now being established, with a view to having them developed into agricultural colleges, if necessary."

Mr. Hammersley seconded the amendment.

Mr. Duce's amendment having been withdrawn, that of Mr. Brown was carried.

After the luncheon adjournment, Mr. Gell took the chair, in order that Mr. Paterson might attend to certain departmental duties.

SHOW BUILDING.

Mr. J. C. Foster moved—"That, in the opinion of this Conference, a strong recommendation to the State Government be made to erect a large building in Perth, in a central position, suitable for holding producers' and poultry shows and exhibitions." Shows of the past held in the city had suffered considerably from lack of sufficient accommodation.

Mr. W. T. Smith (Denmark) seconded the resolution.

Mr. Duce thought the request a most unreasonable one.

The resolution was lost.

A CENTRAL MARKET.

Mr. T. James moved—"That, in the opinion of this Conference, the Government be approached to build a central market for the sale of all produce by auction or otherwise." To get the keenest competition, all the buyers should be brought under one roof. He didn't care whether the Government or a private firm built the proposed market. At the present time things were not satisfactory.

There being no seconder, the motion lapsed.

AGRICULTURAL SOCIETIES.

Mr. Ash moved—"That, in the opinion of this Conference, it is necessary, for the advancement of the interests of producers, that all farmers' societies (show societies excepted) should fall in line, and unite under a common constitution; and that a committee be forthwith appointed to draw up a constitution, to be submitted to this Conference."

Mr. T. Hayward (Harvey) seconded, merely for the sake of discussion.

The resolution was negatived. Several members characterised it as ill-advised.

DELEGATES TO CONFERENCE.

Mr. Ash moved—"That, in the opinion of this Conference, only *bona fide* producers should be eligible for delegates to the annual Producers' Conference."

The resolution was lost.

DATE OF CONFERENCE.

Mr. C. H. Newman (King River) moved—"That, in the opinion of this Conference, all future conferences be held in June, instead of March, as the latter month is a busy time for fruitgrowers and market gardeners."

Mr. Duce seconded the resolution.

Mr. W. Eastough (Upper Chapman) moved as an amendment, and Mr. A. Blaney (Chapman) seconded—"That the date of the Conference be altered to September."

Both the amendment and the resolution were lost.

JUDGING AT SHOWS.

Mr. Ash moved—"That this Conference take into consideration the necessity for improving the system of judging at agricultural shows, field trials, and other competitions in farming, and that committees of experts on such matters be now appointed to draw up scales of points for individual classes, to be submitted to this or the next annual Conference; and, further, that the scales so adopted become the standard, and be printed on suitable forms to be used in judging and recording judgment in all competitions."

Mr. H. Hocking (Wanneroo) formally seconded the resolution, which was lost.

THE FRUIT FLY.

Mr. W. Souness (Mount Barker) moved—"That this Conference urge upon the Government the necessity of taking stringent measures to exterminate the fruit fly, and to prevent its further spread throughout the State."

Mr. Mowforth seconded.

Mr. Harper, M.L.A., said it was not the people who made a living out of fruit who propagated the pest. The part of the inspector had been made extremely difficult, for the owners of suburban orchards had gone so far as to resent visits of inspection. So far as the fly within the State was concerned, the speaker could eradicate it, but it was hopeless to try and keep pace with the importations of the pest. In the case of apples left in the cold, the young fly perished, warmth being necessary to its development. In the orange, however, the insect could live through the winter. He had successfully tried the experiment of putting cheap sacking over early fruit, thus starving out the fly. Unless some stringent action were taken, the pest would get beyond bounds in the small gardens in and around Perth. In terms of praise he alluded to the policy adopted in sending Mr. Compère to try and find the enemy of the fruit fly.

The motion was carried.

PASSES TO SHOW JUDGES.

Mr. M. Brown moved—"That in the opinion of this Conference, it is desirable that the Government issue free passes to judges at agricultural shows."

Mr. Willis seconded the motion, which was lost.

RAILWAY RATES.

Mr. Ash moved—"That in the opinion of this Conference the present railway rates on one and two ton lots, together with the loading and unloading charges on small lots of farm produce, is an unjust tax or penalty on small farmers, and is inconsistent with the Government policy of land settlement; and that a deputation of those interested be appointed to wait on the Minister for Railways to ask for a fair reduction to be made in rates and charges on small lots of hay, straw, chaff, vegetables, fruit, grain, and manures."

Mr. Mowforth seconded the resolution. He had sent to a town certain goods, for which he received £7 12s. 7d. The railway charges on those goods amounted to £9 5s. 11d. Hay, chaff, and green fodder could be sent in 2½ ton lots at the cheaper rates, but the Department refused to carry other classes of produce at these rates.

Other delegates provided illustrations of what seemed to them the unfair incidence of the existing schedule of rates. The chairman deprecated the loading and unloading charges made by the Department, whether that Department did the work or not.

The motion was carried, and a committee was appointed, consisting of Messrs. Ash, Cailes, Brown, Walker, Stone, Newman, Mowforth, Lang, Sutton, Smith, McLarty, and Gell.

FENCING WIRE.

Mr. Fawcett (Murray) moved, and Mr. Williams (Beverley) seconded—"That in the opinion of this Conference fencing wire should be carried by the Railway Department at the same rate as fertilisers."

The resolution was carried.

EXTENSION OF RAILWAYS.

Mr. T. Norrish moved—"That in the opinion of this Conference the Government be urged to extend the present railway system so as to include agricultural districts not yet served by a railway." There was a large area in the Kojonup district that would fully justify the extension of the railway, if not now, at least in the near future.

Mr. Willis seconded the motion. The Jandakot people had for years been living in hopes of the extension of the line through their district.

Mr. Hammersley referred to the disadvantages under which the settlers in the Toodyay district laboured—disadvantages that would be effectively removed by the extension of the railway.

The motion was carried.

PERISHABLE GOODS.

Mr. J. H. Stone (West Swan) moved, and Mr. Smith seconded —"That this Conference views with alarm the action of the Railway Department in allowing trucks loaded with perishables for the fields to be delayed at Perth and other stations, thereby causing great losses to producers." The mover asserted that perishable stuff put on at Guildford Station frequently reached the fields a day late for the auction sale it had been despatched to catch.

The motion was carried.

In addition to the foregoing, the following motion was passed:—"That in the opinion of this Conference the regulations of the Railway Department should be altered so as to compel the Department to carry perishable goods by the train for which they are booked."

BONUS ON EAGLEHAWKS.

Mr. Hammersley moved, and Mr. Bull seconded—"That in the opinion of this Conference a bonus of 2s. 6d. should be placed on eaglehawks."

The motion was carried.

NATIVE DOGS.

Mr. Hammersley moved, and Mr. Williams seconded—"That in the opinion of this Conference the Government should be asked to give a bonus of 10s. for the destruction of wild dogs."

As an amendment, Mr. Brown moved, and Mr. T. R. Lowe seconded—"That the Government be induced to raise the bonus on native dogs to £1 throughout the State."

The amendment was carried.

POULTRY TICK.

Mr. Foster moved, and Mr. Smith seconded—"That this Conference views with alarm the spread of poultry tick, and urges the Government to take drastic measures to stamp same out, and that a reward be offered for a cure or for a means which will render poultry free from the tick's attacks."

The motion was carried.

DUTY ON POULTRY.

Mr. Foster moved, and Mr. Smith seconded—"That in the opinion of this Conference the State and Federal Governments be requested to abolish the present *ad valorem* duty on poultry, and replace same by a fixed duty per head." The mover pointed out that the present duty was a direct tax on purity of breed and consequently on the man that wished to improve his fowls.

As an amendment, Mr. Nenke moved, and Mr. Brown seconded—"That the duty on show birds be removed altogether."

Both motion and amendment were lost.

ANGORA GOATS.

Mr. Lang moved, and Mr. Hammersley seconded—"That in the opinion of this Conference the Government should get quotations for Angora goats from South America, South Africa, and elsewhere, with a view to purchasing same for distribution in this State." The mover pointed out the adaptability of the Angora goat to dry countries. In times of drought they provided mutton superior to that of sheep, and their skins were at all times more valuable. They thrived on bush scrub, and, by the same reason, served to eat it off.

The Chairman pointed out that the Acclimatisation Society was engaged making inquiries on the subject, and had already collected a good deal of information with regard to prices, etc.

On this assurance, the motion was withdrawn.

STUD STOCK.

Mr. Brown moved, and Mr. Nenke seconded—"That in the opinion of this Conference the Government should appoint and remunerate veterinary surgeons to examine the stud stock at the various shows."

After a brief discussion, the motion was withdrawn.

STANDARD OF CHAFF.

Mr. Nenke moved, and Mr. Lowe seconded—"That in the opinion of this Conference a committee of three or more produce merchants and an equal number of representative farmers meet at the opening of the next chaff season and fix a standard of quality for the year, and that purchasers and sellers be bound alike by the sample (as standard), and that same hold good in all cases." The mover spoke of the difficulties attending the present system of buying and selling chaff, owing to the fluctuations of the market.

The Chairman said that the present contract form under which chaff was sold left it open to the buyer to refuse to take delivery of even the best. That put the seller at his mercy, and the motion was aimed directly at such injustice. The system embodied in the motion obtained with regard to wheat in South Australia.

Mr. Williams pointed out that at least two standards would be required.

Mr. Sanderson thought a simpler solution would be for sellers to deal only with reputable buyers.

As an amendment, Mr. Hammersley moved, and Mr. Ash seconded—"That the Produce Merchants' Association of Western Australia be asked to appoint three of their members to meet three gentlemen, to be appointed by the delegates here present, at the opening of the next chaff season, and fix a standard of quality of the chaff for the year."

The motion was withdrawn and the amendment carried. Messrs. Burgess, Willard, and Morrell being appointed to meet the nominees of the Produce Merchants' Association.

Adjournment.

At a quarter past 10 p.m. the Conference adjourned until the following morning.

THIRD DAY.

DISEASES IN SOILS.

Mr. W. E. Ash (Harvey) moved—"That in the opinion of this Conference an experienced bacteriologist and vegetable pathologist should be immediately added to the staff of the Department of Agriculture, for the purpose of making a careful and exhaustive examination of the diseases prevalent in some of our cultivated soils." There could be no doubt as to the necessity for such an official, and though it might mean a salary of £600 a year, yet such expense would be fully justified by results. They had poisons in the State of the nature of which the average farmer was in entire ignorance.

There being no seconder, the motion lapsed.

POTATO DISEASE.

Mr. J. S. Park (South-West Central) moved—"That in the opinion of this Conference the Department should endeavour to obtain, for the benefit of settlers, a correct history of the disease in potatoes known as 'Ring,' as a means to its prevention and eradication." The disease, already common in the State, was spreading with alarming rapidity. He thought that the treatment of the disorder should be included in the functions of the Experimental Farms.

Mr. J. Duce (Wellington) seconded the motion.

Mr. W. Souness (Mount Barker) thought the variety of the tuber grown, and the season of the year in which the seed was planted, had a good deal of influence on the results. He had known diseased seed produce sound potatoes, and *vice versa*.

The motion was carried.

TWO-BUSHEL BAGS.

Mr. Ash moved—"That in the opinion of this Conference the Department of Agriculture obtain from the manufacturers the wholesale prices of two-bushel sacks of a suitable shape for handling corn and potatoes, and order the quantity required by each society in bulk. A suitable shape of sack is 6in. longer than twice as long as wide." He spoke of the benefits of easier handling, and consequent reduction of cost of labour and loss from injury to the produce.

Mr. Duce seconded the motion, merely for the sake of discussion.

Mr. J. C. H. Nenke (Wagin-Arthur) supported the motion. The system was in almost general use in America, and was under consideration in Victoria.

Mr. A. Sanderson (Darling Range) suggested that the motion should be withdrawn, and submitted to the Co-operative Producers' Association.

The Chairman disapproved of the Department being asked to conduct an agency business in bags. They might as reasonably ask it to import manures in bulk.

The motion was lost.

WINES, BEER, AND SPIRIT ACT.

Mr. H. Layman moved—"That in the opinion of this Conference the Act dealing with the sale of colonial wines be so amended as to allow storekeepers and producers to sell same by the bottle without any license." By this amendment the producers would get a price nearer to that paid by the consumer.

Mr. B. Turner seconded the motion, which was lost.

BURNING-OFF PENALTIES.

Mr. W. H. Lang (Capel) moved—"That in the opinion of this Conference the Government should have placards printed and posted on notice-boards at all post offices cautioning persons against setting fires before the time allowed by law, and stating penalties for same." He quoted several cases where, owing to out-of-season fires, considerable damage had resulted.

Mr. H. E. Hamersley (Greenough) seconded the motion, which was carried.

CONDITIONAL PURCHASE.

Mr. V. Hamersley (Toodyay) moved—"That in the opinion of this Conference the Government should be asked to so amend the Conditional Purchase Act as to extend the time for paying for conditional purchase from 20 to 25 years. The purchasers have to pay interest only for the first five years, but extra improvements to be enforced each year in addition to those that have to be done under the present Act during this period." The Minister had already intimated his readiness to look into the question.

Mr. O. Bull (Deepdale) seconded the motion.

Mr. Duce thought the sole result would be the raising of the price of land from 10s. to 12s. 6d.

Mr. Layman opposed the motion. The land purchase conditions were already too liberal. ("Oh, oh.")

Other delegates were of opinion that the motion would result in locking up the land.

The motion was lost.

APPLICATIONS FOR LAND.

Mr. Nenke moved—"That in the opinion of this Conference the Minister for Lands be requested to treat all applications for Government lands in priority from the time they are handed in and accepted by any authorised land agent, and not, as at present, making the time they reach head office the date and time of application." The present system admitted of wire-pulling by covetous settlers to the detriment of new arrivals.

Mr. S. Williams (Beverley) seconded the motion, which was generally supported, and eventually carried.

LAND CLEARING.

Mr. Bull moved—"That in the opinion of this Conference the Government, when declaring agricultural areas, should clear such portions of them as are suitable for cultivation, adding the cost of such clearing to price of land." Settlers from the old country were discouraged at the enormous amount of initial labour unavoidable in Western Australia. In order to secure a proportion of the stream of pioneers flowing towards America, some manual assistance should be held out as an inducement.

Mr. Nenke seconded the motion.

The Chairman explained that, to a certain extent, the wishes of the mover and seconder were already being carried out. In at least two districts the Government had men out ring-barking the timber. This meant that the settler would find the bush all ready for burning off.

Mr. Duce thought the motion outrageous.

The motion was lost.

UNIMPROVED LAND TAX.

Mr. W. J. Bryant (Coogee) moved—"That this Conference is strongly in favour of a tax upon the unimproved values of land." He knew that so controversial a subject was hardly in place in a conference with but limited time at its disposal. On the other hand, however, no other body of men was so well qualified to discuss the question. Land monopoly was general in the State. Within 500 yards of his place was a block of 600 acres of splendid land, which, having been purchased for £5 and a worn-out horse and cart, was now locked up. He quoted the instance of the estate that was offered without avail to the Government for £25,000, and recently re-offered for £11,000.

Mr. G. Willis (Jandakot) seconded the motion. It was positively unjust to ask a man to effect improvements, in order that he might be taxed thereon.

Mr. Duce was in favour of anything that would burst up monopolies, but was not anxious to pay taxes on that part of his own holding he had as yet been unable to improve. He moved, as an amendment—"That this Conference favours the introduction of the labour conditions into the Land Act." If the ex-owners of the Stirling Estate, near Bunbury, had been obliged to conform with these conditions, the Government would have received better value for its money when it purchased that estate.

Mr. Lang seconded the amendment, which was lost, the resolution being carried by a large majority.

LEGAL FENCE.

A resolution on the agenda paper read :—" That in the opinion of this Conference the Government should be asked to define a legal fence." This was withdrawn, with the tacit understanding that members of Parliament would be asked to again introduce the question into the Lower House.

FENCING ACT.

Mr. Sanderson moved, and Mr. Ash seconded—" That in the opinion of this Conference the Fencing Act be so amended that the cost of fencing between adjoining blocks of land be equally borne by the respective owners, without waiting for the complete enclosure of either of the blocks."

The resolution was carried.

THE DECIMAL SYSTEM.

Mr. Ash moved, and Mr. Sanderson seconded—" That this Conference is strongly in favour of the adoption by the Federal Government of a decimal currency and a decimal system of weights and measures, and that the Chambers of Commerce and the Departments of Agriculture in the Eastern States be asked to co-operate in this movement."

The resolution was carried.

At 12 noon the Conference adjourned until half-past 9 a.m. the following morning.

FOURTH AND LAST DAY.

Before proceeding to the consideration of the agenda paper, the Conference appointed Messrs. Souness, Bull, and Bryant a deputation to wait upon the Premier with regard to fruit importation. Messrs. Mowforth, Brown, Laing, and Stone were appointed to bring under the Premier's notice certain anomalies in railway freights.

ROTTNEST SALT.

Mr. J. A. Dugden (Brunswick) moved—" That in the opinion of this Conference the rate on crude Rottnest salt for agricultural purposes should be reduced to ' A ' rate, with a one-ton minimum." The present rate carried a minimum of four tons, which was far too much for the average farmer.

Mr. Ash (Harvey) seconded the motion, which was carried.

TELEPHONES.

Mr. Arthur Blaney (Chapman) moved, and Mr. Sanderson (Darling Range) seconded—"That, in the opinion of this Conference, it is extremely essential, in the interests of agriculture, that country districts be provided with telephonic communication; and this Conference respectfully urges upon the Government the necessity of allowing the railway telephone posts to be used for the furtherance of that purpose."

The resolution was carried.

Mr. T. Williams (Goomalling) moved, and Mr. V. Hamersley (Toodyay) seconded—"That in the opinion of this Conference it is desirable to instruct all surveyors in the Eastern districts to reserve all suitable places on Crown land, for conserving water by well or dam, that are within a reasonable distance of each other, so as to benefit present settlers and encourage further settlement." Both speakers urged the necessity for efficient water conservation.

The resolution was carried.

INTERDICTING WAX MATCHES.

Mr. W. H. Laing (Capel) moved, and Mr. H. E. Hamersley (Greenough) seconded—"That in the opinion of this Conference the Government be asked to prohibit the sale of wax matches in this State."

Most of the delegates speaking to the question expressed sympathy with the spirit of the motion, though five, only, felt justified in voting for the measure.

The motion was lost.

FOOD LABELS.

Mr. J. Sutton (W.A. Beekeepers' Association) moved—"That in the opinion of this Conference all persons responsible for the manufacture or production of foodstuffs should be compelled to attach to package of same (as a guarantee of quality) a label giving the name of the article contained therein, or, where such contents are made up of two or more component parts, the names of each different article used should be stated." There was no Adulteration Act in Perth, with the consequence that honey, at least, sold as pure was frequently found to be shamefully adulterated. So, too, with preserves and sauces.

Mr. Ash seconded the motion. They should keep open the broad avenue of jams and preserves for their rapidly developing fruit industry.

Mr. Duce thought the motion would place the local manufacturers at a disadvantage as compared with those of the Eastern States.

As an amendment, Mr. W. J. Bryant (Coogee) moved, and Mr. J. N. Cox (Murray) seconded—"That this Conference would ask the Government to introduce a Pure Food Bill."

Mr. Sanderson thought the motion was too comprehensive. The Health Act met the case; and the fault, if any, lay with the administration of that Act.

Mr. H. Hocking (Wanneroo) declared the impossibility of procuring in Perth a bottle of pure tomato sauce, whether imported or locally made. He knew a manufacturer of honey who was driving a brisk business in Perth.

The amendment was carried.

ARTESIAN WATER.

Mr. Hamersley moved—"That in the opinion of this Conference the Government should be asked to bore for artesian water in dry districts of this State." The want of water in the dry districts was preventing settlement. The Government dam East of Northam had been most beneficial; and more should be done in that direction.

Mr. Edwards (York) seconded the motion.

On the suggestion of Mr. Duce, the word "artesian" was omitted, on which the motion was agreed to.

IMPORTATION OF PARASITES.

Mr. Cox moved, and Mr. Ash seconded—"That this Conference highly approves of the work the Department of Agriculture has undertaken in collecting the primary parasites of scales and pests which attack the orchards of this State."

The resolution was carried

GREAT SOUTHERN RAILWAY.

Mr. Nenke (Wagin-Arthur) moved—"That in the opinion of this Conference the Government be requested, in the interests of the railway service of the Great Southern Railway districts, to place a more proportionate value on the Great Southern Railway, by making a considerable reduction on the present value placed thereon." He claimed that the railway was being made to bear too great a burden of interest. Nine trains a day were run without fully meeting the demand, yet the line could not pay.

Mr. Norrish (Great Southern) seconded the motion.

Mr. Sanderson could not see the benefit likely to result from the carrying of the motion. In his opinion, a better service could be obtained only by larger settlement.

Mr. Hamersley thought a reduction of the capital value of the railway would tend to lower the rates charged.

Mr. Hocking contended that the scale of the land affected by the line should be credited to the cost of the railway. An improved service could then be secured.

The motion was carried by a large majority.

DESTRUCTION OF WILD DOGS.

Mr. V. Hamersley moved, and Mr. H. Hamersley seconded—"That the Government be asked to inquire into the success of a new method of trapping wild dogs, and, in the event of that success being verified, that the discoverer be employed to give exhibitions to settlers."

The motion was carried.

BRANDS ACT.

Mr. H. Hamersley moved, and Mr. Williams seconded a motion to the effect that attention be directed to the fact that the provision in the Act relating to the publication of brands in the *Government Gazette* was not being carried out.

The motion was carried.

DEHORNING CATTLE.

Mr. Eastcott (Wagerup) moved, and Mr. Hamersley seconded—"That the Government be urged to amend the law, so as to admit of the legalising the dehorning of cattle."

The motion was carried.

THE ATTENDANCE.

Mr. Mowforth (Albany) moved, and Mr. Souness seconded a resolution affirming the necessity for a roll call at future conferences, in order to ensure the better and more regular attendance of delegates.

The motion was carried.

THE NORTHERN PASTORALISTS.

Mr. Sanderson moved, and Mr. Lowe seconded a motion, regretting the absence of representatives of the Northern pastoralists, and expressing the hope that the omission would be filled at the next conference.

The motion was unanimously carried.

A QUESTION OF SYNTAX.

The last business motion to come before the Conference was moved by Mr. Lowe, and seconded by Mr. Cox. It read—"That when the Department of Agriculture sends out notices for the next conference, some definite instructions be given with a view to securing greater care by the various societies in the preparation of resolutions." The mover pointed to the careless syntax apparent in a percentage of the resolutions that had been considered during the session.

The motion was carried.

VALEDICTORY.

Complimentary votes were passed to the Chairman (Mr. Gell). the Director and officials of the Agricultural Department, and Press, The Conference rose at 1 p.m.

A RECREATIVE OUTING.

TRIP DOWN THE RIVER.

DEPUTATIONS TO MINISTER FOR LANDS.

At the invitation of the Minister for Lands, Mr. J. M. Hopkins, M.L.A., the delegates spent the afternoon on the river in the "Manx Fairy." The Premier (Mr. W. James), and Messrs. Harper, Jacoby, Atkins, and Oats, M's.L.A., accompanied the party.

Shortly after leaving the William Street Jetty, Messrs. J. Mowforth, W. Challand, and D. Smith, representing the residents of Torbay, waited upon Mr. Hopkins. The object of the deputation was to lodge a protest against the recommendations of the Albany Roads Board touching the divisions of the district into wards, and the number of members to be allotted to each. The voters' lists of last year, it was explained, had contained 327 names, and under the proposal of the Board the West Ward would include 230 of these, with three representatives, while the Central and East Wards combined would be given four representatives for 97 voters.

In reply, the Minister conceded the apparent justice of the protest, and promised to give it every consideration before agreeing to the recommendation of the Board. The Department had appointed an officer to proceed to the district and inquire into the whole circumstances of the division.

At a later stage in the journey a deputation from Walkaway asked the Minister for Lands for a trucking yard at that place, the nearest being at Dongara, 15 miles away. A guarantee had been received from certain station owners in the district to truck nearly 4,000 head of stock, in addition to which other squatters would be frequently utilising the yard. A number of settlers in the district were going in for mixed farming, and they, too, would require facilities for trucking their cattle.

The Minister promised to refer the matter to the Minister for Railways.

Mr. Jacoby introduced a deputation from Bull's Brook, asking for £90 for the erection of an Agricultural Hall. A sum of £45 had been collected, and Mr. S. Copley had transferred the necessary land to the Crown. The same gentleman had offered land for a post-office and police station, the offer to remain open for twelve months.

Mr. Hopkins promised to refer the matter to the Minister for Works.

THE TOAST LIST.

At about 1·30 p.m. a landing was made at Point Walter, where luncheon was served in a large marquee, pleasantly situated a few yards from the jetty.

Mr. Hopkins proposed the toast of "The Agricultural Interests." He was pleased to meet the delegates, and hoped the trip would prove enjoyable, and that, taken in conjunction with the good work they had been doing in conference, it would be an inducement for them to return next year with renewed vigour. With the toast he wished to couple the name of Mr. Gell.

In responding, Mr. Gell regretted the absence of Mr. Paterson, the Director of Agriculture. So recently as five or six years ago it had been said that Western Australian producers would never overtake the local demand, more particularly in regard to wheat and chaff. He was proud to be able to affirm that, in respect to the latter commodity, they had already come up with the demand. (Hear, hear.) In the matter of wheat he felt confident that, with the expansion going on in land clearing and settlement, they would achieve their object in less than two years. Of course, that would depend upon the development of the goldfields, to which in the chief degree Western Australia owed the immense increase in her population. If new fields were found development would increase even more rapidly, and it might then take longer to get up with the local demand. For some time past, however, he had remarked that the influx of population had been in great part composed of agriculturists rather than that of miners. With all due deference, he maintained that in some lines of fruit the demand had been overtaken. He had seen 40lb. cases of good grapes sold for 2s., which could be accepted as a fair indication of the state of the market. In another two years apples, pears, and other fruits would be in plentiful supply. He hoped that none of them would ever have occasion to be disappointed with the industry.

Mr. Harper proposed the toast of "The New Minister for Lands." When first he met Mr. Hopkins in the responsible position as Mayor of Boulder, he had said to himself, "Here's a man who has got a bit of grit in him." When, a short time afterwards, Mr. Hopkins was appointed to the Legislative Assembly he soon proved that he was capable of expressing his views, and of fighting for them also. When he (Mr. Harper) realised that the late Minister for Lands was leaving the State, he at once decided that the most suitable man—at all events on the Government side of the House (laughter)—was Mr. Hopkins, and he was glad to find that the Ministry had thought the same. He was sure that despite any mistakes Mr. Hopkins might make, he would work solely in the interests of the State. (Applause.)

Mr. Arthur Blaney supported the toast.

In responding Mr. Hopkins characterised Mr. Harper as one of the staunchest friends of the Western Australian farmer. Fully realising the many and varied difficulties of his position as a Minister of the Crown, his first desire was to acquire a thorough knowledge of the Department, of the country, and of the farmers and producers. He thought his strongest opponents would admit that since taking office he had been busy. (Hear, hear.) He was leaving town next morning on departmental business, and would return on Saturday. On Monday morning he would leave again, this time with Mr. Harper, and would go through that gentleman's district. While at York the other day he had appointed a local land agent and a land guide, and had suggested to the people that they should form a society for the promotion of land settlement around York. He was confident of the possible success of such a scheme even in a long-settled district like York. On coming into office he had found surveys and inspections both in arrears. He hoped to remedy all that and to see that before the transfer of a conditional purchase was affected the transferror had complied with all conditions. (Hear, hear.) Within the past 10 days no less than five selectors who had been to the South-West had come into the office only to find that the land they required had been taken up two months ago. Surveys would be taken in hand as quickly as possible, and plans prepared, so that anyone calling at the office could see at a glance what remained for selection. If people in agricultural centres would but form such societies as he had indicated, they would bring under the notice of the Government splendid properties suitable for subdivision, but which were now being used only as sheep runs. At the same time they must remember that the Government were determined to buy in the cheapest market. An estate offered at £25,000 had been reduced to £11,000, and he understood another reduction was now contemplated. It was for the genuine settler anxious to try his luck on the land that he was anxious to provide. In the past instances had not been wanting of men who by dint of picturesque recitals of struggle and want, had secured Crown land at absurdly low rates, only to sell immediately at a cash profit. Such profit, he thought, should be the property of the State. (Hear, hear.) He was impressed with the great resources at hand, but he could not be expected to put everything in order as with a magician's wand. It would take time, though if he could have the assistance of those engaged in agricultural pursuits, success must wait upon the combined efforts. He had some splendid officers in the Department, but information was required from the settlers themselves. He wanted to see personally the whole of the State before the next session of Parliament. With a Minister for Lands in the Upper House the Department had been at a disadvantage when its Estimates were under discussion in the Lower House. His desire was to do the best he could to make Western Australia an exporter of produce. (Cheers).

Having been photographed, the company returned to the steamer, which proceeded as far as Blackwall Reach, where she was swung round for home. Reaching the wharf shortly after 5 p.m., the assembled delegates before dispersing, heartily cheered the Ministers.

DEPUTATIONS.

THE CODLIN MOTH.

The deputations appointed by the Conference early in the day were introduced to the Premier (Mr. Walter James) by Mr. Paterson, the Director of Agriculture, during the afternoon of Friday, the 27th March.

Representing the fruit industry, Mr. W. Souness reminded the Minister that some years ago, with a view to escaping the codlin moth, restrictions had been placed on the importation of apples, pears, and quinces. The Act had been very successful in minimising the danger; but, as the result of agitations on the goldfields and in South Australia, the restrictions had recently been removed. Since that time the pest had appeared in the State, to the manifest alarm of the increasing community of fruit-growers. His duty was to urge the Government to, if possible, reinstate the prohibitive regulations. It was not a passing question; it was a matter for all time. At times not less than 70 per cent. of the fruit had to be destroyed, and he would ask the Government to take vigorous measures in protection of the industry.

Mr. O. Bull held that, while importation was allowed, it would be impossible to keep out the codlin moth. With the pest in the State cheap fruit could never be grown, for 75 per cent. of it would be found to be worthless. During the past few years planting in the State had progressed so fast that, with protection against the codlin moth, cheap fruit would soon be assured. The removal of the restrictions had not had the anticipated effect of cheapening the product—leastways, not to any appreciable extent.

Mr. W. J. Bryant had no doubt that the Government had acted conscientiously in removing the interdiction. Just the same, even Ministers should admit that the loose manner in which inter-State growers had since sent in fruit rotten with the codlin moth was detrimental to the best interests of local growers. In the first few weeks of the current year nearly 2,000 cases of imported fruit had been seriously affected with the disease.

In reply, the Premier characterised the published statements of Sir Richard Baker (South Australia) as unjustifiable—those of a man who formed opinions on the strength of a twenty-four hours'

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visit. He thought the local inspectors were doing admirable work. They could afford to treat with contempt those unjustifiable assertions. Western Australia was that day the cleanest State in the Commonwealth. Prohibition, he thought, could not be legally enacted. He doubted if under the Federal Constitution they could say blindly that no fruit should be imported. What the consumer of the State wanted was clean fruit, and he was certain there was not a man in West Australia but was prepared to support any legislation calculated to keep out infected fruit. Nobody wanted cheap fruit at the expense of the local grower. There was a great deal of force in the contention that the inspection of the past had not been sufficiently rigorous. The regulations had been amended, giving ample power to insist upon the strictest inspection and the condemnation of any consignment thought to be risky. Certainly men in the Eastern States wishing to exploit the market by thrusting diseased fruit upon West Australia should be taught a lesson. As for men anxious to import affected fruit, they would probably find that under the amended regulations such policy would not pay. He was unable to agree to the request of the deputation. He thought if the Government endeavoured to do all that under the regulations they could do, it would be better than proceeding to illegality, and so making matters worse.

FREIGHT ANOMALIES.

Mr. Martin explained that, although special long-distance rates were provided by the Railway Department, they were so hedged about with restrictions that it was well-nigh impossible to take advantage of them. One difficulty lay in the making up of sufficiently large consignments, as a result of which the concession tended to play into the hands of the middleman. A four-ton lot sent from Albany to the goldfields cost £6 18s., while two tons cost £6 9s. 2d., and two tons and a half £8 1s. 5d. Freight for four-ton consignments was at the rate of £1 14s. 6d., and for small lots £3 4s. 8d. The grievance was of long-standing.

On being referred to by the Premier, Mr. Hope, an officer of the Railway Department, said the four-ton rate would be charged on the smaller parcel only in the case of it being the cheaper.

Mr. Martin, resuming, detailed the sending of a consignment of produce to Kalgoorlie, on which he had to pay £9 in freight, and for which he received £7. He was not quarrelling with the schedule. He wished merely to be allowed to avail himself of the lowest rate. If his stuff occupied but three-parts of a truck he was charged with the whole truck, even though another's produce was piled in to fill up.

Mr. W. H. Lang complained of the loading and unloading charges. If the consignor were to load the truck and the consignee unload it, still these charges would be enforced by the Department.

Mr. Hope explained that in such case an application to the Department would secure a refund of the overcharge.

Mr. Lang quoted instances of produce loaded into railway trucks having been taken off in the wrong direction.

In reply, the Premier pointed out that the loading and unloading charges were lower than ever before. Two shillings per ton for the double service was certainly a reasonable charge. The minimum freight charge was not something that had cropped up during his term of office; it was a matter of long standing.

Mr. Lang: Well, we don't like being imposed upon.

The Premier: Don't be imposed upon; battle away for yourselves. Whenever you have any trouble of this sort, I would advise you to write direct to Mr. Paterson, the Director of Agriculture, and if it should entail much extra work we will provide additional assistance for him.

LECTURE ON POULTRY.

By F. H. Robertson.

The following was delivered as a lecture by the Poultry Expert to the Department of Agriculture, Mr. F. H. Robertson, before the members of the Claremont Poultry Society:—

The breeding of poultry, whether for show or utility purposes, has, during the past 20 years, made wonderful progress all over the world; from very small beginnings, it has now assumed vast proportions. The time has gone by for the poultry breeder to be considered a poor, simple, and small-minded individual—a sort of crank, who potters about among cocks and hens and tends to chickens. The production of birds for purposes of exhibition has, in some countries (particularly in England and America), become, with large numbers of persons, a lucrative business, besides bringing to many thousands of amateur fanciers pleasant, harmless amusement for their spare hours, also a frequent handsome addition to their ordinary earnings. If evidence is wanting in confirmation of the extent of fanciers' operations, one has only to look at the journal *The Feathered World,* the most important out of many in England. Its New Year number has over 80 pages of closely-written matter and 50 illustrations; the advertisements of stock for sale take up a large portion of the space. Great as are the ramifications of the fancy portion of poultry breeding, the raising of fowls and eggs for human consumption is much more extensive, and the figures of Government statists have of late come as a surprise, not only to the outside public, but to poultry raisers themselves. We all know that wool is one of Victoria's greatest productions, yet Mr. Fenton states that it is exceeded in value by poultry and eggs—valued at two millions. In the United Kingdom it is estimated that the present annual crop of poultry and eggs is worth nearly 10 millions sterling, in addition to which there are the importations from foreign countries, amounting, in 1902, to over seven millions. The principal countries from which the supplies came are: Russia, Germany, Denmark, Belgium, France. It is, however, to the United States of America that we must look as the country which has made the greatest strides in the production of poultry and eggs. In the year 1899 the product of poultry farms alone was valued at £55,000,000; and the total yield is estimated to exceed both the cotton and wheat industries, and is six times the total output of gold, four times the yield of silver, three times the value of all sheep and wool—equal to the combined value of the total interest on all mortgages and all minerals combined.

Poultry production in Australia has been steadily increasing, and most of the States have been large exporters. During 1902 New South Wales sent away about 200,000 head, principally to South Africa. Victoria and New Zealand are also large exporters. And now we come to Western Australia. I never heard of her sending away a single fowl, chick, or egg; but, on the other hand, she is now sending out of the country 60,000 golden sovereigns every year to other States for eggs alone, not counting live and frozen poultry, nor the fanciers' yearly contribution. What can our West Australian farmers be thinking about to allow such a state of things to exist. What a golden opportunity they are missing; and in such a country, too, so admirably adapted for the raising of fowls, and in many parts for ducks, geese, and turkeys. The climate of the coastal districts is all that can be desired for their production. On the other hand, the ordinary natural conditions of soil, grass, and insect life favourable to poultry are in many cases absent, thus giving many farmers the impression that fowls are difficult to rear, and consequently do not pay. The absent natural conditions must be artifically supplied; and this, I fancy, is where our farmers fail—chiefly in the want of knowledge as to how, when, and where to provide the necessary requirements requisite for the successful breeding, rearing, and the maintenance of a suitable supply of poultry for the table, and a plentiful supply of eggs. As showing the apathy of our farmers on this subject, I have made a rough calculation, and find that if every person in this State who makes a living out of the products of the soil were to market the eggs from 25 hens per annum, it would give a return of over £100,000, thus more than wiping off the importations. My calculations are based on the low estimate of 100 eggs per hen and the price at 1s. per dozen, whereas the wholesale price at present is from 2s. to 2s. 6d. a dozen. This question rests entirely with the farming population. If they would only give the matter a little attention and study, this £60,000 per annum would go into their pockets, instead of augmenting the incomes of brother agriculturists in the other States. The necessary expense is very trifling; and the time occupied by the women folk or junior members of the household in attending to the poultry could be easily spared. I know the men on the farm frequently have a great down on the fowls, owing to their becoming a nuisance in the stable and fodder rooms, but if insecure doors are used, or none at all, it can only be expected that the birds will go where food is to be obtained; it is best to fence off a few runs in parts where trees are numerous, thus supplying both day and night shelter; the money spent in wire-netting would soon be paid for out of the product of egg and poultry sales.

The success or failure in keeping poultry depends on how they are kept, and of first importance is the manner in which they are housed. The climate of Western Australia being a very mild one, the close and warm houses, such as are described in poultry books as the correct thing for the other side of the world, besides being expensive, are not at all suitable for us; in fact, unless very few birds are kept in each house, disaster is likely to ensue, because, in my opinion, a great amount of disease is caused by keeping birds too warm at night time. Tree shelter is undoubtedly the best for producing robustness, but it is also necessary to exercise discretion in this matter, as it is not uncommon to find living trees as badly infected with vermin as the ordinary wooden fowlhouse. Trees with soft, scaly bark should not be used, nor those which shed their leaves, such as fig and other fruit trees, as fowls stick very closely to their accustomed perches and are likely to remain in the same spots through the cold weather, when all the leaves are gone. The well-known pepper-tree is very good, but for preference I like the castor oil tree; it grows very quickly, thrives in sand, is smooth in bark, and if the seeds are nipped off as they appear, it branches out in all directions, making splendid perching room. The thick foliage affords good protection against cold winds, and as a day shelter from summer's scorching sun it is hard to beat. Good roosting accommodation may be made in any tree by sinking in the ground upright posts a few feet away from the trunk, and to them can be nailed cross pieces as perches, thus using the foliage as shelter while the fowls are snugly nestled among the leaves. A large number of birds can be thus accommodated in a single tree. Graduated perches should, of course, be provided to enable the birds to reach the high timbers in the tree. Even with this system it should be arranged that no two pieces of wood overlap each other, so as to cause a breeding place for vermin. Birds roosting in trees generally keep in good health, and the out-door existence seems to make their coat impervious to rain. Whilst listening in my bed to the heavy down-pouring rain, such as we are accustomed to in June, July, and August, I have wondered how my birds in the trees are faring, only to find in the morning no sign of the previous night's deluge beyond a little dampness in the tail feathers.

As trees cannot be produced by magic, and many properties are quite devoid of them, therefore there must be a fowl-house of some sort if home-laid eggs are wanted. The aims with most persons is to combine economy with effectiveness, so if only a few hens are kept nothing is cheaper than a large empty case; knock out one side and the bottom, raise it about a foot from the ground, and for perches sink into the ground two uprights, on to which lightly nail on the roosting perch, cover outside the top and sides with tin to keep out rain and draughts, and paint white or limewash. If a larger house is wanted, iron is the best material, but let it be as airy as possible yet free from draughts. Perches are best all on one level, and not more than three feet from the ground. Fowls always prefer the highest roosting places, and they are the best, provided the birds in their descent can make an extended fly so that they may alight gently on the ground; but owing to want of space in the general run of fowlhouses, they alight heavily, which if to a hard surface, is a constant source of corns, terminating in bumble foot. Perches should not be permanent fixtures, but only lightly kept in position by removable nails; whether the perches be large or small, there should be no sharp edges. For a floor the natural West Australian sand is the best, but the droppings should be raked up every morning. To do so effectually, a home-made rake is required, as all bought rakes are too wide between the teeth, and leave nearly as much manure as they collect. I do not believe in lime-washing the inside of the fowlhouse, unless it has become so thoroughly infected with vermin that nothing but a thorough washing will do. The *red mite*, which is the general fowlhouse pest, first makes its appearance in the woodwork of the perches, and from them, if neglected, spreads all over the house; but if the perches are taken to pieces once a fortnight and painted with kerosene all vermin will be destroyed, and no lime-washing required; besides, being a nasty thing to handle, lime soon looses its strength, and instead of being a preventative of lice only acts as a harbour for them.

Although many careful poultry-keepers provide suitable roosting accommodation, they omit to give their birds day shelter against cold winds and hot sun; if trees are not available, artificial breakwinds and shade should be erected. Fowls running about a farmstead have but little difficulty in finding all required in this respect, but where birds are in pens many things have to be done if they are to be kept in a healthy condition. One important requirement is the bath. In winter time a dry dust spot is necessary, but the reverse is required for the hot weather. The place which is the dry bath in wet weather, if well damped with water two or three times a week, is soon found out and much appreciated. If plenty of water is available during the very hot weather, if the shady portions of the pens are hosed every evening, nice cool resting places are thus given the fowls to recline in, and thus make life more endurable for our feathered friends during the times the thermometer hovers in the vicinity of 100 in the shade for weeks at a time, for be it remembered that they cannot reduce their clothing, but with wings well out from the body and distressing panting, their lot is not an enviable one; so by all means let us make things as comfortable for them as we can.

The next important question is that of feed. Wheat, bran, and pollard are our staple foods, and for changes there are oats, maize, barley—and peas when we can get them. Buy your feed as cheap as you can, but let the quality be nothing but the best. In using oats, have none but the best New Zealand stout variety, known in the trade as B grade. There is a fair variety obtainable in hard feeds, but of meals there are only two, viz., bran and pollard. If some miller could be induced to make a meal of good stout oats, and ground husk and all to a course flour, I am sure he would have a ready sale for it to poultry-keepers.

As many parts of this country are quite devoid of animal food in the shape of grubs, worms, and insects, it must be supplied where required. I prefer to give it in the form of minced raw meat, mixed with the soft feed; the meat obtainable is frequently too coarse to go through the mincing machine, or may be too stale to keep until the morning, in which case boil it to shreds; next morning, the meat being quite soft, can be easily broken up and mixed with the meal; warm up the broth also, adding it to the soft food, which should be reduced to a dry, crumbly condition, and served to the fowls, not on the bare ground, but from feeding troughs or off clean bags or boards. Soft food should not be mixed with cold water. Boiling hot water is the best; pour it over the meal, holding the kettle in one hand, and with a small trowel in the other, work the feed and water together, allow it to cool, and if at all sticky, reduce to the proper consistency by the addition of more pollard; the soft food is given in the morning, the earlier the better, and hard feed at night. There can be no fixed rule as to the quantity to be given; more fowls are over-fed than under-fed; if feed is thrown down, so long as they eat it readily will in many instances be more than they should get; fowls are very greedy, and if there is a suspicion that they are getting too fat, a few should be caught to ascertain their condition. In throwing down grain, select the clearest ground, and scatter over a large area, so as to lessen the pecking and fighting and give the weaklings of the flock a chance to get their fair share. I do not consider it necessary to make it a hard-and-fast rule to give soft feed every morning; the great thing to be aimed at is variety. If fowls are inclined to get too fat, reduce the amount of soft feed especially, and go in for whole grain, oats preferred, varied by peas, if obtainable. Crushed bone is also excellent for laying fowls or forcing young birds on, but must be given quite fresh. To keep up a regular supply of greenstuff right through the year is rather a difficult matter in this dry climate, but if possible let the fowls have a little every day; it is too valuable to risk wasting any of it, so the safest plan is to cut it all up into shreds or small pieces. A handy vegetable cutter for this purpose would meet with a ready sale if such were obtainable. Salt is not injurious to poultry, as some persons imagine. I consider a little should always be added to the soft food. Good sharp grit is a necessity which is rather difficult to obtain. A great deal of that sold is unsuitable, being round and water worn; what is required is sharp, hard gravel or crushed quartz;

shell is also good and liked by the fowls, being of use for shell-forming purposes. Lime is frequently strewn in poultry pens by some persons. This, I think, a great mistake, as likely to be injurious by causing inflammation of the intestines, also causing the legs to lose their colour. The use of lime in poultry yards is, I consider, a popular fallacy. As already pointed out, it acts as a harbour for vermin, is injurious if swallowed, it is unpleasant to handle, will ruin the clothes, and there is always the danger of unslacked lime getting wet, thus causing fire. Lime is a necessity to fowls, but not in its crude state; let it be given in the form of sea shell or crushed bone or oyster shell. Broken glass I cannot recommend on account of the risk of sharp-pointed pieces being likely to do harm. Broken crockery is also readily taken, but some authorities consider there is a risk in using it on account of deleterious substances employed in its manufacture.

Let the poultry have clear water; a running stream is the best, but this is obtainable in very few places. An empty kerosene tin makes a cheap and effective drinking vessel; from one side cut out about two-thirds of the tin, hammer down the sharp edges, and place it under the shade of an empty box facing the South; if the outside bottom is painted it will keep sound much longer. Give the water fresh and clean every day, thoroughly rincing out the tin, and occasionally using a little phenyle to make it quite sweet. On no account should the water be exposed to the sun, and in summer time, if the tins are filled at night time, cool water is a certainty in the morning.

Insect vermin is one of the pests that have to be guarded against, and its presence often goes quite unsuspected until the loosening of some of the woodwork in the fowl-house fully reveals to the unsuspecting amateur the presence of large clusters of little red insects, which nightly feast on the poor fowls whilst on the roost. I have already referred to the means of exterminating this pest. The lice which lives on the fowls is quite a different species, and will not be much in evidence if dust baths are available. It is, however, not uncommon to find some birds, like some human beings, adverse to keeping themselves clean; so if there should be any birds which are in apparent good health but present a seedy-looking appearance, they should be caught and examined, and if found infested with vermin a good dusting with insectabane will soon put things right. Lice are most numerous during the breeding season, and if kept down then do not give much trouble during the hot weather. The poultry tick is another pest which has of late years come very strongly in evidence; it is a much more serious matter than either of the two last-mentioned, owing to the fatal results that ensue on its introduction, and the difficulty in eradicating it from the fowl-yard. Thousands of poultry die every year from the effects of this terrible pest, and in a great many instances its presence is quite unsuspected; and it is only when the fowls have died off in large numbers that the cause is ascertained. It is a pity that something was not done on the first appearance of the poultry tick in Western Australia to keep it in check; it has now, however, got such a strong hold that nothing remains but to study the best means of fighting the pest, or perhaps declare localities now free of it as clean, and prohibit any live poultry being brought into those districts. In the Murchison district, round about Cue, Day Dawn, Lennonville, and Mount Magnet, the pest is very thick. Wherever there is a fowlhouse there also will the tick be found, rendering it a difficult matter to keep fowls alive, and almost impossible to rear chickens unless elaborate precautions are taken.

The life history of the tick, or *Argas Persicus*, is rather curious, and very similar to the cattle tick, which also, I understand, it resembles. The eggs are laid on the ground of the fowl-house, under leaves, dry manure, or in crevices of wood. They are laid in clusters, and are of a pinkish colour. The eggs hatch by themselves, and the young tick, which is of a greyish colour, has six long legs, and is light and active in its habits, and on the eager look out for a fowl to fasten on to; it buries itself in the flesh, chiefly under the wings. There it remains in clusters for some time, how long I cannot say; it then drops off, assumes the form of a bug, and takes to the wood-work of the fowlhouse, secreting itself in the cracks, a favourite hiding place being under bark or splinters; there it remains quiet all day and comes out at night time, and, crawling along the perches, fastens on to the legs or feet of the fowls, inserts its sharp proboscis between the scales and sucks the blood until it has its fill. One can imagine what a drain it must be on, say, 20 or 30 fowls having some hundreds of ticks nightly sucking away their life blood. The fowls soon present a miserable appearance, dull in plumage, and shrunken in comb, gradually getting weaker and weaker until they succumb. All, however, do not die, and many seems to get accustomed to the pest and live amongst them, but of course they cannot be said to thrive; but should fresh fowls be introduced to a tick-infested yard they are at once attacked and fare very badly; any poultry-keeper finding tick in his yard must assail the pest in every possible manner. A common remedy is to burn down the fowl house, but, besides being an expensive mode, may not be successful if adjoining a wooden fence, which is likely to harbour them; if fire heat is applied it can be done by saturating the inside of the shed with kerosene, a part at a time, and setting fire to it, or if the whole interior is thoroughly painted with caustic soda not many ticks are likely to survive; boiling water poured into all cracks is effective and inexpensive. Another good plan is to entirely isolate the perches. This can be done by hanging them on wires suspended from the roof, but as the ticks would crawl down the wire it is necessary to make a cup half way down into which the ticks will drop, and, if the receptacle is filled with some sticky substance, such as treacle, they are thus baulked in their endeavour to reach their host. The wires, if run through the neck of a bottle, makes a simple cup; and, again, if the vertical posts, to which the perches are nailed, are made quite smooth and entirely free from cracks, and painted with limewash, to which is added dissolved glue and alum, the tick will be unable to crawl up the posts. When the young ticks are found on the fowls they are easily destroyed by smearing them with oil or grease. Ticks are exceedingly tenacious of life. They have been known to exist for a year enclosed in a bottle. I have seen them in the fencing round a yard which had not contained fowls for over 12 months. Now that this pest has become so common, the greatest care should be exercised in ascertaining that bought poultry come from clean yards; the safer plan is to hatch from bought eggs if fresh birds are wanted. As a precaution, all poultry brought from infected districts to clean localities should be carefully examined to ascertain if any young ticks are on the fowls, and all crates should be at once burnt in case there should be mature ticks secreted in the woodwork.

All live stock are liable to be affected by some complaint or other at some period of their existence. Anyone who keeps horses will know that something will go wrong with some of them, and treatment will be required according to the nature of the complaint. The same applies to sheep and cattle. The man who is working, say, 20 horses, will make it his business to know something of the complaints that they are liable to be affected with, and have at hand some simple remedies with which to treat them, and in severe cases call in a veterinary surgeon. But, strange to say, the man who has 20 fowls seems to think that they have no right ever to get sick, and if some ailment does occur and through neglect they die, the conclusion is come to that fowls are a nuisance and not worth keeping. This is surely a quite unreasonable way of looking at the question; and then as to treatment, if such is decided on, the two favourite remedies are either castor oil or kerosene, no matter what is wrong with the bird; in any case, both are quite unsuitable medicines for poultry. Castor oil will only make them worse, and kerosene, if applied outwardly, irritates the skin very much, and if applied for roup, swells up the nostrils, and does not cure the complaint. Fowls are liable to be affected by a number of diseases, all of which require totally different treatment. Supposing castor oil were good for one affection, it would be quite the reverse for another. It is, therefore, absolutely necessary for all poultry-keepers to at least be able to recognise the symptoms of the principal diseases, such as cold, roup, canker, cholera. The first-named is very prevalent among the young stock at this time of the year (March), when sudden changes from extreme heat to cool are likely to give them a cold, which, if not attended to, leads to roup. The slight running at the nostrils, which is the symptom of cold, will often remain and yet not affect the general health of birds. My plan is to pen up such birds for about 10 days, keep them warm and well fed, principally with soft feed and plenty of greenstuff; wash out the nostrils once or twice a day, and add a tonic to the drinking water, and on being turned out it will be generally found that they will gradually shake off the complaint if given a free run. Cholera or acute dysentery carries off many birds without their owners knowing what is wrong before it is too late.

For* this complaint chlorodyne is most efficacious. Unless fowls are very valuable, it is not desirable to devote too much time in doctoring them. Better far to use all precautions to prevent disease. Given plenty of run, good sound food given on perfectly clean ground where there are no droppings, clean water, grit, airy and clean fowlhouses, and disease is not likely to occur. The great fault is trying to rear too many fowls on a limited run, or overcrowded in stuffy fowlhouses. If such is done for any length of time, the soil becomes tainted, the birds pick up the disease germs with their food, and sickness soon follows. If fowls are kept in enclosed runs, it is a good plan to keep some runs always empty, and sown with grass or green fodder of some sort, so as to turn fowls into when the soil is getting at all tainted. The best plan of all is to let them have a perfectly free run on land naturally provided with grass, grit, clean water, and insect life; and, if horses are kept, the manure heap will be a constant source of exercise, thus keeping them active and in good fettle. Under such conditions as these there will be little sickness, a good supply of eggs, and but little labour required in looking after the flock; all should go well, provided of course that a good class of poultry is kept. As to this point there are a great variety of opinions; many persons consider that the more common and mongrel the breed the better the fowl; this I consider wrong, and unless mixed fowls show traces of pure blood in them, of the good laying varieties, it is very improbable that the egg production will be sufficient to pay for their keep. If mongrel fowls are kept, it is best to get rid of all the male birds and replace them by strong, healthy pure-bred cockerels; or, better still, I consider, to breed quite pure stock, if even only for the sake of having birds of uniform colour or markings it is worth while doing so. A flock of, say, 50 white fowls in nice condition is a very pretty sight, but I cannot say there is anything attractive about a similar number of all colours, shapes, and sizes. A crate of birds all uniform in size and colour is sure to fetch a better price in the open market than the variegated lot. More important advantages are the better egg production, or table qualities, according to the kind of breed kept; another source of increased profit would be from selling eggs for setting and birds for stock purposes; in fact, a little money spent in judicious advertising would result in a ready sale of all birds of good appearance. Complaint is sometimes heard about the difficulty of selling pure-bred stock at anything above common or killing prices. Such will be the case if the breeder does not make known the fact that he has good poultry for sale; it is necessary to advertise. There need be no fear of the thing being overdone; the supply will create the demand. If country-bred pure poultry were continually on offer at moderate prices, more persons would go in for pure stock. The fancier or breeder of show birds, perhaps, might then complain about being undersold by the flooding of his market by the low-priced farming breeders. This would be a short-sighted way of looking at the business, as the more people who go in for breeding pure stock, the greater will be the demand for good specimens for stock purposes.

If pure-breds are to be kept, the question is which is to be the one. There are so many varieties to choose from that the novice is likely to get bewildered, especially as nowadays so many new breeds have come into existence. Several of them are excellent, and others do not come up to expectations. The selection of a breed very much depends on natural surroundings, also whether the production of eggs is chiefly sought for; or perhaps birds solely for the table are wanted, or maybe for show or fancy purposes only. Most people, however, have a liking for some particular breed, and it is not a bad rule to decide on the one a person fancies most. He may perhaps like to keep several breeds, say one for egg production, another for the table, and another because they are handsome, and so on, until he finally decides to keep half a dozen varieties, and there, in my opinion, he falls into error straight away. Whether your grounds are large or small, unless, of course, you are a breeder on a large scale, go in for only one breed. It will simplify matters wonderfully, especially in the breeding season, as birds will fly where they should not, and mix things up horribly; besides, the person who keeps only the one kind can make a special study of the breed, and is more likely to attain success, either in the show pen or for utility purposes, than he who does a little with several breeds. Another thing to be avoided is the running of ducks and fowls in the same yard. They both require totally different feeding and accommodation, the chief drawback being with the water, as the ducks will be continually at it, thus making it unfit for the fowls.

Anyone about to start the making up of a pen of pure-bred poultry should now very soon commence operations, because it is of great importance to start breeding early in the season, the best months for hatching are June, July, and August, and certainly not later than September; the earlier the better. Chickens hatched when the weather is nice and warm do very well, but they are very disappointing, as they grow very slowly, but have hearty appetites, and consequently don't pay. They are also more liable to disease than the chicks hatched during the cold weather.

If a good supply of eggs are wanted, any of the Hamburg varieties are exceedingly productive. They are very pretty, but are not largely bred in Western Australia, chiefly on account of their great flying capabilities. They will get over any fence, so have to be wired in overhead; another objection is the smallness of their egg. Spanish fowls are a breed of the past. Their place has been taken by the justly popular Minorca. Its excellent qualities are too well known to dwell on. Suffice it to say that, given a good strain, and taking weight of egg into consideration, it will equal, if it does not excel, any other variety. I know of an authentic Perth record of an average of 219 eggs per hen for the 12 months. Leghorns, brown and white, are splendid layers, and invariably give the greatest satisfaction. A good Andalusian is a real handsome fowl, and quite equal to any of the other Mediterranean breeds in egg-laying. All of these breeds have a failing which would not suit those persons who also combine gardening and poultry breeding, that is the fondness of the cockerels and pullets for flying. They are very active on the wing, and manage to get over great heights, if so minded. There are good and indifferent laying strains amongst the Mediterranean breeds, and when selecting a pen for egg production, choose birds that are bright-looking and active, with good-sized combs, yet not so large as likely to be a burden. Want of size in body is no disadvantage. Small birds are to be preferred to extra large heavy ones, slow in action, as these big birds frequently have other blood in their composition, such as Game, Langshan, and Malay, which has been introduced by unscrupulous breeders in order to obtain some fancy point, such as length of limb, tightness of feather, etc.

What are termed the all-round breeds (that is combining good laying and table qualities) have of late years come very prominently to the front, particularly Orpingtons and Wyandottes, and indeed good laying strains run closely the Mediterranean breeds in numbers of eggs laid, but their eggs are rather smaller. They possess the advantage of not being so flighty as the other breeds, and are more easily handled. Langshans were also once a good all-round breed, but typical specimens cannot now be recommended, owing to possessing too great a length of limb, causing a lot of trouble in rearing, owing to leg weakness. Plymouth Rocks is another variety which has now not so many admirers as formerly, chiefly owing to the advent of so many new breeds. It is a good all-round fowl, and one which might well be taken up by breeders in this State. The Dorking is another of the good useful sort that is now much neglected, not only here, but all over Australia. To successfully take up this breed, it would be advisable to import at least fresh male birds from England, as, owing to their being so few Dorking breeders in Australia, stock is too much inbred. The Houdan is another useful variety, which is even scarcer than the Dorking and is also suffering for the want of fresh blood. The heavily feathered breeds, such as Brahmas and Cochins, are now practically out of the running, at least so far as Australia is concerned; this, I think, is much to be regretted. As a fancy fowl, the Partridge Cochin Cock is a wonder of beauty, and, I think, the King of Poultry. Brahmas are also handsome, and if bred for utility purposes, that is minus the excessive feathering worn by the Show specimen, they are a real good all-round fowl. Coming now to the purely table breeds, Malays and Indian Game stand right out, and if crossed with any other breed the table qualities are immensely improved; they are, however, miserable layers, especially Malays, and any gentleman who imagines that by keeping this breed he will have a constant supply of extra superior table poultry, will be very much disappointed, for the simple reason that he will not be able to get enough eggs to raise a large number of chickens. The Indian Game is a much better fowl, it is handsome and smaller in bone than the Malay, and finer in flesh; also a better layer. The modern English Game, having been bred so much for fancy points, is now a Show bird only. The old type of English Game has been revived and is a good sort of breed, and one that might well be taken up in this State.

Of purely fancy fowls there is a great variety, many of them very beautiful, and it would greatly add to the attractions of our Shows were more on exhibit. First among them are Polish, viz., the black white crested, also the gold and silver spangled, good specimens of any of these are very pretty, especially the first named. They are delicate fowls, particularly the blacks, owing to their liability to roup, on account of the crests being wet every time a drink is taken. Bantams, of which there are nearly as many varieties as full sized poultry, are very much neglected. Any fancier who has premises too small for keeping full sized poultry would find the breeding of these beautiful but diminutive specimens of the feathered tribe a most interesting hobby.

* Coming to ducks, the best known varieties are Aylesbury, Pekin, Rouen, and Indian Runner. The two first named are the most popular, but pure specimens of either breed are by no means as numerous as they should be in this State. The Aylesbury, with its pure white plumage and massive body, is a grand table bird, and a very fair layer. The Pekin, as seen in Australia, is not so heavy, its looks are deceptive, being more loosely feathered, but being a better layer is generally the more popular bird of the two. For utility purposes they are best crossed. The Rouen is by far the handsomest of all domestic ducks, and the colour and markings of first class specimens are very beautiful. As a utility bird it does not rank with the white breeds, being slower in maturing, and not a great layer, but if crossed with the Aylesbury a very fine bird is the result. I have seen cross Rouen and Aylesbury drakes weighing 10lbs. live weight at six months, without special feeding. The Indian Runner, although a new breed, has caught on well in this State, and are now fairly plentiful. They are the meanest looking of all ducks, as a rule; but fine show specimens are decidedly good looking, and of striking appearance. Owing to their light weight they are poor table birds, but as layers they are the Leghorns of the duck tribe. Some people swear by Muscovys as the best breed of ducks; they are certainly a good table bird, and make fine brooders, but their plain looks and quarrelsome disposition do not tell in their favour.

Of pure bred geese, the two principal varieties are Toulouse and Emden. There are some good specimens of both varieties in this State. Either breed are valuable for crossing with common geese to improve size. In districts where there is a fair supply of grass the raising of geese is very profitable, as beyond a little grain at night time to bring them home, little else is wanted.

Turkeys do very well in the country, but not in the limited suburban areas, where they are very likely to become affected with roup. They must have unlimited run, where they can pick up most of their living. With the advent of the American Bronze Turkey all other breeds are of secondary consideration. Show specimens go up to enormous weights, as high as 40lbs. for a full-grown gobbler; the standard weight is 34lbs., and for a cockerell 22lbs. Hens and pullets weigh very much less, viz., 18 and 14lbs. In mating turkeys it is necessary to breed from fully-matured birds, a two-year-old gobbler to a two or three-year-old hen. is best; if not obtainable, a two-year-old hen to a well-developed one-year-old cockerell. Nothing below these ages should be bred from. A great many of the failures in turkey rearing are owing to breeding from birds that are too young.

And now, in conclusion, we come to the important question: Does keeping poultry pay? I most unhesitatingly state that it does, and in any department, whether for Show or utility purposes, although many persons in all parts of the world have found to the contrary, even in Western Australia such was found to be case. The same thing applies to any pursuit. A lot of money can be lost in storekeeping, timber trade, produce, or any other calling, if you only go the wrong way about it. A would-be poultry farmer on one occasion came to a man who thoroughly knew the business, and had made money out of it, asking his advice as to how he should lay out his £500, which he proposed to invest in the industry. On ascertaining that he knew nothing or very little about fowls; also learning that he was fond of travelling, but had not done much of it, he advised him to go and enjoy himself, and spend half his money, and then he would have only half of it to lose. For an inexperienced man to launch out into poultry farming on a large scale is the height of folly, and yet it is frequently done by persons who are of a sanguine or mathematical turn of mind, and have figured it out. They reason because the ten fowls in their back yard make a clear profit of £10 a year, therefore all that has to be done is to keep 40 times that number, or 800, to earn £400 a year. This does not work out in practice, as 800 fowls would take up a lot of ground, thus increasing expenses for buildings, extra labour engaged, rent, interest on capital, and so on; whereas the 10 fowls in the backyard lost nothing for labour, rent, or interest on capital invested, and but little for feed. At the same time, I do not wish it to be implied that poultry-farming, pure and simple, will not pay in this country, I believe it will, and pay well; but the person who runs it must have served a practical apprenticeship of some years, and, in addition, he must be a thorough smart business man, so as to get the best value for his products, and also be a good buyer. Combined with fruit and vegetable-growing poultry will pay well, but it is as a by-product to the mixed farmer that poultry, ducks, geese, and turkey raising will pay best. There is always a good demand for prime fowls, chickens, ducks, and at certain times the demand is very active. Geese are not in great request, the poor quality of those offered in the markets causes them to be but little asked for. Given a good article, the trade and the public will soon find it out, and pay accordingly. The grower knows that if he sends lean sheep, he gets a poor price; just the same with poultry. Feed the young stock well and sell them quickly, then they show a good profit; if old birds and culls have to be disposed of they should not be sent to market, but eaten at home. Ducks if handled properly are fit to sell in 10 to 12 weeks' time, if kept after that the profit is lost fine prices are realised at certain times of the year; the same with turkeys, good young gobblers go up to fancy prices at Christmas time. But it is with eggs that the best profits are to be made, owing to the good prices they fetch, they are always dearer here than in any of the other States, and during the months of February, March, April, and May splendid prices are realised, going as high as 2s. 6d. in the wholesale market. As the old fowls are moulting during those months, pullets should be hatched early enough to come on when the old birds stop. Weed out all old hens and all male birds that are not required for stock purposes. Pullets should not be sold unless at very good prices. During the time that local eggs are cheap and plentiful it is a good plan to preserve for home use when they get dear, your own fresh eggs can then all be sold and the potted ones can be used in the house. As the advantages of egg preservation become better known, no doubt large numbers of stored eggs will be placed on the market, and sold as such. There is room for great development in the egg trade; surely if it pays South Australian farmers to export to here, subject to all the incidental expenses such as duty, packing, insurance, freight, commission, etc., amounting to about 4d. a dozen, it must pay our local farmers a handsome profit to secure this market themselves. The prices of feed are certainly higher here than in South Australia, but this cannot remain so to any marked degree; the sliding scale is reducing 20 per cent. every year, and in another four years will be quite off. By the end of that time wheat will be very little dearer here than in the other States, also produce must come down in proportion, so that unless egg production is more largely engaged in the chances are that the importations will go on increasing every year instead of decreasing. Anyhow, at the present time the local producer has 4d. a dozen in his favour, and as a fresh egg must be produced in its own country there is a splendid market which is, strange to say, not availed of. Finally, as it may be rather difficult to remember many of the things what to do and what not to do, a few "don'ts" may be of assistance:—Don't *over-feed*. Don't *over-crowd*. Don't give *sun-burnt* water. Don't keep *old fowls*. Don't keep fowls and ducks *together*. Don't forget the *dust bath*. Don't keep *mongrels*. Don't go in for *poultry farming* on a large scale, and Don't miss any *poultry lectures*.

NOTES ON CULTIVATION OF WHEAT.

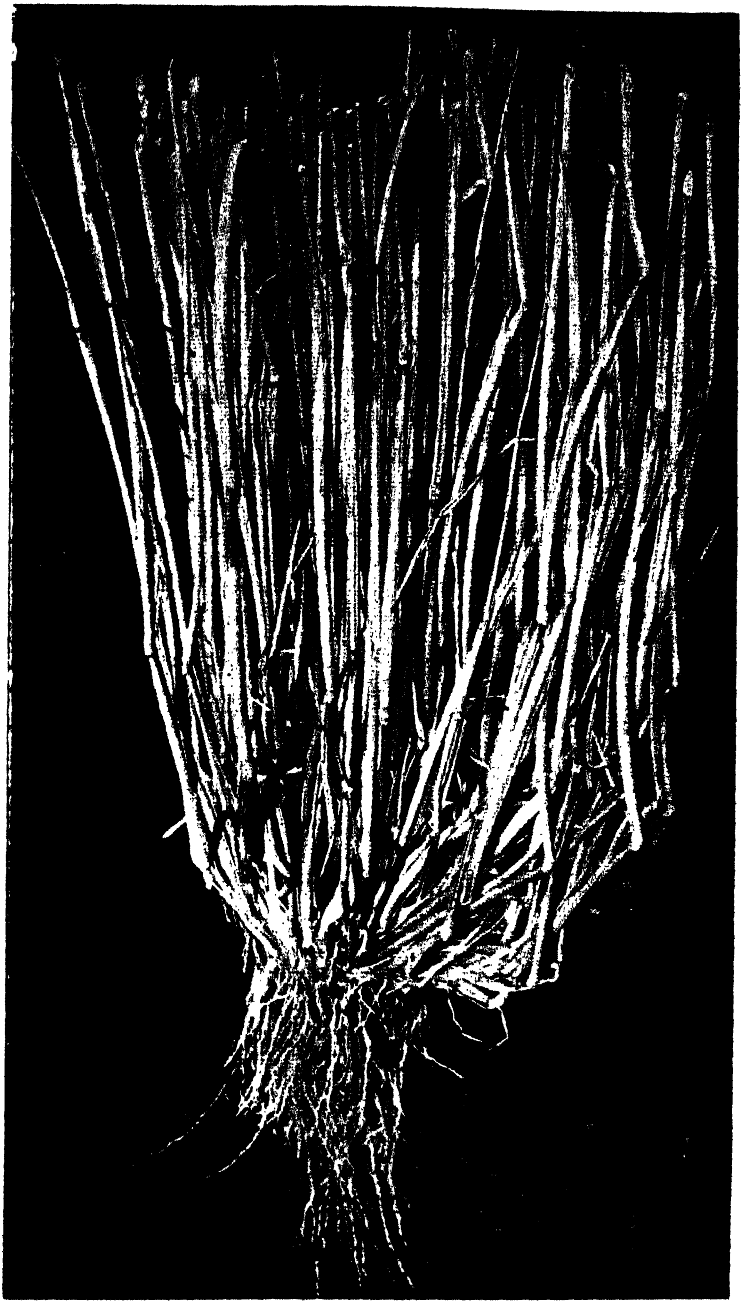
By Percy G. Wicken.

Great difference of opinion exists as to the depth that land should be ploughed for a crop of wheat; so much depends on the nature of the soil and the local conditions that experience alone can decide the matter. In ploughing new land, it is not advisable to go too deep and turn over a quantity of the subsoil, which is sour, to the surface, as this deteriorates the crop. At the first ploughing in a shallow soil it is best to only turn the surface soil over, and allow that to sweeten first, each succeeding ploughing being done a little deeper, and mixing a little more of the subsoil with the surface soil.

The land can be ploughed much deeper for early sown crops than for late sown ones, as in the late sown crop the plants do not get sufficient time in which to develop their root system, and are unable to take advantage of the increased depth of soil.

The most satisfactory way in which to cultivate a wheat crop in this State is to fallow the land during the previous winter, and then to sow the crop as early as possible, only cropping the same land every second or third year, but as this system is not available to beginners, who have to get a large area of land cleared before they have sufficient to be able to fallow, other methods have to be carried out, and the same land cropped for several years following. Where this has to be done the land should never be ploughed the same depth for two years in succession; either plough deeper or shallower than the previous year, and, if possible, the land should not be ploughed in the same direction; it should be ploughed one way one year and cross-ploughed the following year. The amount of cultivation necessary to be given to the soil after ploughing so as to bring it into a proper state of tilth for sowing the seed varies so much in different classes of soil, and according to the implements used, that it is impossible to give the number of workings required. Where disc ploughs are used, and the soil is in fair condition, the ground is almost fit for sowing after ploughing. Other land breaks up into lumps, and will require several harrowings and rollings before it is fit for the seed.

Sowing.—The question of thick or thin sowing for grain is one which is much discussed in our drier districts, and the department hopes to be able shortly to carry out some experiments on this subject and to report on the results. A great quantity of seed is wasted by the too-thick sowing of land. There are about 800,000 seeds in a bushel of average size wheat. This allows 158 seeds to a superficial yard, or about 17 to a square foot. Under the most favourable circumstances it is impossible for this number to grow, and even allowing for half the number failing to germinate the number is still too great. In discussing this question the "tillering" or "stooling" properties of the variety sown should be taken into consideration, some wheats being of the sparse stooling

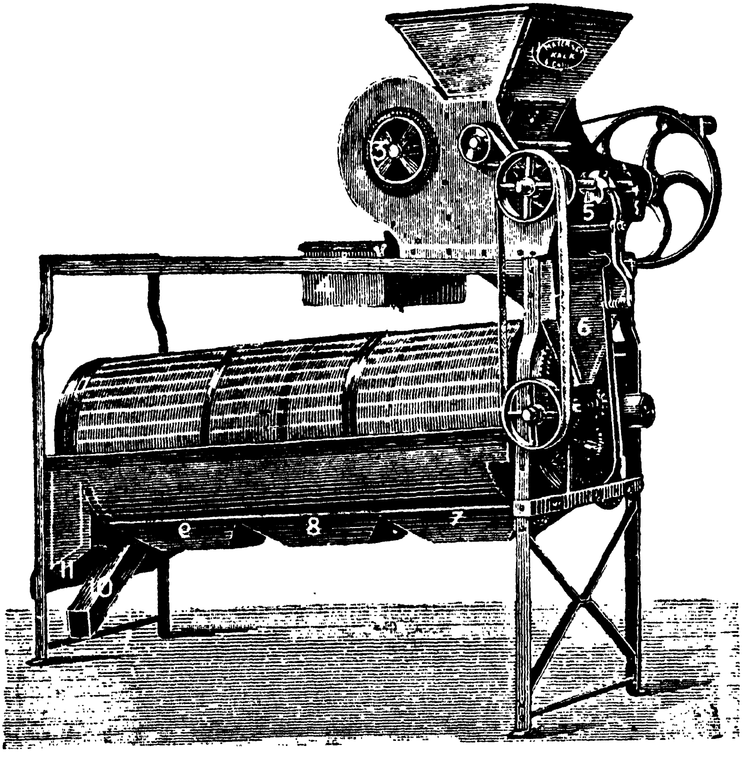


A Stool of Steinwedel Wheat.

varieties and others of the free stooling varieties. Thin sowing, if the crop is sown early, is an inducement to the plant to stool out, and some varieties will give much better results if allowed ample space.

The accompanying illustration is a plant of Steinwedel wheat which produced 125 heads, each of which matured a full head of wheat. When sown by hand with the drills at a distance of one foot apart, and the seed in the drills five inches apart, from six to seven pounds of wheat will sow an acre of land, but as it is impossible to sow this quantity by a drill the cost of sowing by hand is too great to compensate for the extra cost of sowing. The smallest quantity that the ordinary seed drill will sow accurately is from half to three-quarter bushel per acre, and as a general rule this quantity is sufficient if the land is well worked and the crop sown early, gradually increasing the quantity as the season for sowing advances.

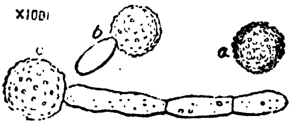
Another important point to be considered, and one I fear too often neglected, is the grading of the seed wheat. If a good sample



Kugerre Wheat Grader.

of plump grain is required it is necessary that the seed wheat should be of the best quality; it is a mistake to suppose that anything will do for seed. It will pay the grower well to grade all his seed wheat before sowing. A machine can be used for this purpose which will grade the grain into several sizes. The smaller and cracked grains can be used for poultry feed, and the balance only sown.

The accompanying illustration, taken from the New South Wales *Agricultural Gazette*, shows the proportion of large and small grain taken from average samples of a number of wheats. The continuance of this system of grading of seed wheat helps to improve the quality of the grain produced each season. As time goes on, and our production of wheat becomes equal to or more than the consumption, wheat will have to be graded before it can be sent to the mill, as is now done in the other States, the millers there not accepting a sample which contains broken or shrivelled grains.



Smut or Bunt Spore.

Smut or *Bunt* is a disease that is the cause of serious loss to growers in some districts. When the disease appears in the field nothing can be done to cure it for that season. The smut attacks the ear, as shown in the accompanying illustration.

Stalk showing affected ear.

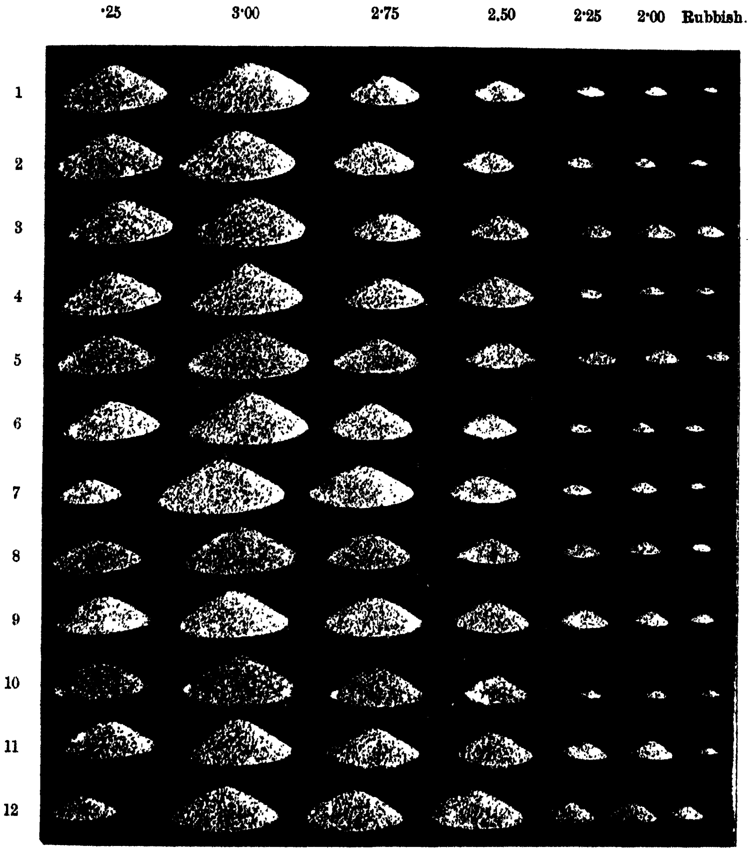
The remedies consist in preventing the smut appearing in the succeeding crop, and may be placed under headings as follows:—

(1.) Avoid seed from smutty crops or districts.

(2.) Stimulate a quick and vigorous growth of the crop.

(3.) Avoid using the straw from a smutty crop for making manure.

(4.) Subject the seed to the hot water treatment, which is carried out as follows: Provide two boilers or tubs of sufficient size to enable the quantity of wheat which you propose to dip at one time to be thoroughly immersed without upsetting the water; you also require a thermometer, and a basket or a gunny sack to put the wheat in for dipping. Heat one boiler of water up to boiling point, and then pour sufficient hot and cold water in the other boiler to make the temperature up to 132½° F., which is the proper temperature. Plunge the basket or bag of wheat into this water, and keep it there for 15 minutes, occasionally lifting and turning it round, and plunging in and out, so as to enable the water to thoroughly penetrate through all the grain. The temperature



Showing the proportion of large and small grains in each variety—

1. Red Straw.
2. Golden Drop.
3. Rattling Jack.
4. Allora Spring.
5. Canning Downs.
6. Talavera de Bellevue.
7. Budd's Early.
8. Early Para.
9. White Velvet.
10. White Tuscan.
11. Velvet Pearl.
12. Blount's Lambrigg

must not go below 130° or above 135°, and this is kept up by adding hot water as occasion requires, mixing it well with the water already in boiler. When the fifteen minutes is up, take the seed out and plunge into cold water; lay the seed out to dry, if not sown at once. This will destroy all the smut spores. This method is known as the Jenson hot water treatment.

(5.) Another method, and one perhaps more generally used than the preceding one, is to soak the seed in a solution of bluestone. Dissolve 1lb. of bluestone in 5 gallons of water. This will take some time in cold water, but if dissolved in boiling water it will take much less time. This solution is made up in a tub or barrel, and the wheat dipped in the solution for a period of five to ten minutes, when it is taken out and placed on two sticks laid across the top of the barrel and allowed to drain. It is then spread out on the floor and allowed to dry, and is then ready for sowing. Care must be taken that the liquid is allowed to penetrate through the quantity in the bag. It is customary to pickle one bushel, and sometimes half a bag, at one time, and this requires to be well shaken about to allow the liquid to penetrate through the grain.

(6.) Rotation of crop is no doubt of great assistance in checking this disease, and no variety of the cereal tribe should be planted the following season on land on which the crop has been attacked by smut. Avoid buying seed from a district which you know to be affected.

(7.) It is stated by the pathologists that a single head of smutted grain may contain 500,000,000 spores, that is to say, a number of spores so great that if they were distributed evenly over an acre of land, there would be over 1,000 spores on every square foot; and as the spores are instrumental in spreading the disease it is no wonder that it spreads so rapidly and soon becomes general in a district, and therefore every method should be taken to check its spreading, and all seed should be treated by one of the above methods.

The Stinking Smut or *Bunt* is not so easily discovered in the growing crop as the ordinary smut, but, when thrashing, the grains can easily be distinguished by their swollen appearance, and when crushed with the fingers emit the characteristic smell from which the disease takes its name. The treatment is the same as for the ordinary smut.

Ear-Cockle in Wheat is a disease, caused by a nematode, which attacks the newly-formed ear. A full description of this disease was published in the last issue of the *Journal.*

Rust.—This disease is one of the worst that attacks the cereal tribe; but owing to the dry climate of this State, it is one that we are almost free from. In the Eastern States, however, it is almost impossible to grow wheat in the coastal districts on account of the rust, and the crop has either to be cut very early for hay or else such varieties as the Macaroni wheats grown, which are very little affected by rust. Many varieties of wheat are much less susceptible to rust than others, and in case of rust appearing in any district, it would be as well to go in for a change of seed to a variety not so susceptible, and to give the affected land a rest. Scientists can tell us very little about this disease. It appears suddenly some seasons, and ruins the crop, and other seasons the district is almost free. It is generally worst in wet seasons and on undrained land. When this same land is drained the rust is not nearly so bad. No treatment of the seed previous to sowing has any effect in preventing the attacks of rust.

After Cultivation.—The advantage of feeding off, harrowing, and rolling the crop after it is above ground is one on which there is considerable difference of opinion, but I am inclined to the opinion that where the crop makes a rank growth early in the season, it is beneficial to run a flock of sheep over the ground and eat it down. This causes the plant to stool out well, and will, in most cases, increase the yield, besides the benefit derived by the sheep from the succulent feed, and by the crop from the droppings of the sheep. This feeding off, however, must be done quickly. A large number of sheep should be put on at one time, and not be left too long on the crop, otherwise they will eat the plants too low and injure the crop. Whether the crop is eaten down or not, I think it will be found of benefit to run the roller and harrows over the ground when the plants are several inches high. In our dry districts the action of the roller would be to make the soil compact and possibly cause it to cake, and thereby allow it to lose its moisture by capillary action. It is, therefore, much better to harrow the ground after rolling, as this loosens the surface and helps it to retain the moisture, and the few plants dragged out by the harrows are rather an advantage to the remainder of the crop than otherwise. This rolling and harrowing after sowing should not be done while the ground is at all wet, otherwise it will cause the ground to cake. This working is also an advantage, as it leaves the surface level and breaks the lumps, and enables the reaper and binder to work nearer to the ground than would otherwise be the case, and, therefore, to cut more of the straw; where the stripper only is used, these last remarks will not, of course, apply.

(To be continued.)

GATHERING AND MARKETING FRUIT.

By A. Despeissis.

As the fruit ripens it is picked, packed, and marketed. More skill is required to effect these operations to the best advantage than is at first imagined, and in this respect past experience is of no mean value.

Gathering

plays an important part in the keeping of fruit. Just when and how to pick is an art which is acquired, but certain peculiarities when observed will secure for the grower the reward of his labour.

The right stage fruit should be picked is in a measure governed by the market it is destined for. The local market is best supplied with fruit fully ripe, when it possesses in its fullest measure all its succulence and attractive colouring. For shipment to distant markets, and for long keeping, it is imperative to pick fruit when ripe, but before it reaches the period of full maturity. In such cases, quality and appearance must give precedence to long-keeping quality. There is no very well-defined line showing ripeness from full maturity, and here experience is needed; that experience, however, is easily acquired.

If the fruit is picked too green it also often shrivels, lacks flavour, and does not sell to advantage.

Apples are picked at different stages. Most large, early soft-fleshed apples, such as John Gladstone, Red Astrakan, Lord Suffield, and others of the same class, should be gathered early before they are fully ripe. They then travel much better. They should be marketed as quickly as possible after picking.

It is surprising how quickly early apples lose their freshness and, therefore, their marketable values after being gathered. They soon become mealy, disorganisation of their tissues set in, and they rot.

As regards mid-season apples, the state of the market should influence the period of picking.

Late apples for home use or local market should be left as long on the trees as possible. It is certainly a mistake to sell with mid-season fruit apples, which if kept a month or so longer, would sell much better.

For long-keeping apples for export, gather when the fruit is full grown, and the pips turn dark brown or nearly black. They will colour and mature during transit.

Pears require in gathering much the same treatment. Early pears should always be gathered for market before they become fully ripe, and should be marketed rather under than over ripe. Mid-season pears may remain on the tree a little longer, except the Bartlett or William's Bon Chretien, which picked when fully grown, but hard, ripens without shrivelling. Late pears should be picked before they are fully ripe, or else they become gritty. Kieffer's pears are picked two or three weeks before they are fit to eat. Apples and pears, when fit to be picked, snap clean off the fruiting spur upon being lifted gently upwards. This avoids breaking off the fruit spur to which they are attached, and upon which next year's fruit would be produced.

When picking peaches it should be remembered that a fine appearance always infer good flavour and other merits. Peaches and apricots seldom colour well after they are picked. Picking is one of the most difficult parts of the business of peach and apricot culture. Most people can pick green pears and apricots and knock them down to the ground, but it takes some experience to judge by a subtle feeling of the fruit when pressed between the finger and the thumb, when it is ready to come off. After a little practice the picker can generally tell by the colour of the fruit whether it is fit to pick or not. When a large number of trees have to be gone over it is advisable to pick a little too soon rather than let the crop get ahead of you, as when ripe the wind often brings them down by the bushel. It is sometimes two or three weeks from the time the first apricots and peaches are fit to pick until the last are ripe; the trees should be gone over two or three times a week. In some large orchards in America the pickers do not climb up the trees, this process being considered slow, and resulting in much green fruit being knocked off. In those orchards it is preferred to jar the tree when the dew is off and collect the ripe fruit, which then does not pick up dirt. For that purpose the ground underneath the trees is reduced to a fine tilth, so as to save much bruising from the falling fruit. The jarring is done with a long pole or bamboo with a hook fastened at the end, and the knack of delivering the blow results in just that fruit which is of the proper stage of ripeness being brought down. A similar process is used when gathering prunes.

Plums may be picked almost green for distant shipment, as they colour in transit. This is even more noticeable in the case of the Japanese plums, which ripen and colour very well when stored in a cool, dark place.

Cherries and plums, if allowed to hang too long, are severely affected by the fruit-rot fungus. For the same reason they should always be picked when dry, or else decay will soon consume them. When picking cherries and plums the stem should be cut off with the thumb nail and the fruit itself should not be touched, lest the delicate bloom is rubbed off.

Figs are picked when fully ripe; they do not ripen after picking and do not become sweeter than when cut from the tree. As they do not ripen all at once, the trees must be gone over daily. A ripe fig is soft to the touch and is generally wrinkled and hangs downward. Some kinds, when ripe, show seams or cracks on their jacket. For drying they should be cut when they contain about one-third of their weight of sugar; for eating they may be gathered when they are sweet and palatable. They should on no account be shaken off the trees, as bruised figs soon sour, and a few such would spoil a whole box full. Pulling the figs from the tree will also injure them. The proper method is to cut each ripe fruit clean off the branch and carefully place it in boxes or trays.

Grapes are best pulled when fully ripe. If picked when just coloured, but tart, they wont ripen further. The bloom always shows when grapes ripen. Care should be taken when picking the bunch to hold it by the stem, which is then snipped with shears. Early, tender grapes, with soft skin will transit better if picked before they are fully ripe. More fleshy grapes, on the other hand, gain both as regards quality and appearance if allowed to hang until sun-kissed and quite ripe.

Gooseberries may be marketed either green or ripe. It is considered less exhausting to the bush when the smaller fruits are picked green and the finest ones allowed to ripen. Green gooseberries are stripped from the branches quite rapidly. They may then run through the fanning mill to free them from leaves and then packed for market.

Currants are allowed to colour, and are picked when they are ripe.

Strawberries are picked with their stalks when they have quite coloured. A strawberry which has a green or white tip seldom carries well if picked at that stage.

Blackberries and raspberries are not necessarily ripe when they have coloured. They should be soft and free from acidity, when they shake off the bushes readily and part from the stem on which they grow.

Melons sometimes puzzle the inexperienced growers. Water melons often sound hollow to the percussion, the stalk begins to wither, although this is not an infallable sign. A crackling sound is heard when pressing lightly on the melon. One of the best symptoms, however, is the clearer colour of the rind, which at times shows a faint tint of yellow. Musk and rock melons when ripening sometimes crack more or less up to the stem. On pulling they should come clean off. Some of the larger varieties do not part so readily from the stem, and if pulled show a large hole in the rind. In such case it is best to cut the stem.

PEARL MILLET.

Pearl or Bulrush Millet.

Few amongst the summer fodder crops susceptible of being successfully cultivated in this State excel or come up to the Pearl Millet. Its botanical names are varied, but it is more generally known as *Penicidaria spicata* (Willd.).

Under the name of Bajri it is extensively grown in the North-West provinces of India.

Last summer a few seeds were distributed amongst several settlers from a small parcel introduced from America by Dr. J. M. Y. Stewart, of Guildford.

The success which has attended the efforts of these trials is told in the following letter received by Mr. Despeissis:—

Keysbrook, April 3, 1903.

Sir.—*Re* "Pearl Millet," kindly supplied me by you in December last, I beg to report results as under:—I sowed the seed on December 14th, in drills that were three feet apart, dropping a couple of seeds every 18 inches. The land was ordinary farm land, not swamp, and had recently had a crop of Swedes taken off it. The land was unmanured save for such manure as had been left from the Swede crop—superphosphate. I kept the ground cultivated. In three months the crop was from seven to eight feet high and the seed heads were matured. (I say "crop"—the seed supplied me sowed half of a square chain of land). I harvested the crop about the 14th of March. Each plant averaged about 10 seed heads, some having more, some less. I saved about a wheat bag full of them, and shall have no idle land next summer. As a drought-resisting plant it is marvellous. In January, although I couldn't find a trace of moisture in the soil, the millet was growing at the rate of a foot a week. Thanking you for your courtesy in supplying me with the seed.

I have, etc.,

Edward Wallace.

Mr. Despeissis, Viticultural Expert,
Agricultural Bureau, Perth.

BEE-FARMING.

A Wonderful Honey District.

The Blue Blocks, in the Upper Glenelg district, which are to be thrown open to selection shortly, form one of the finest honey districts in Australia. A recent letter in the *Argus* from Mr. T. Bolton, a prominent apiarist, drew attention to this point, and investigation shows that there is good reason why the Minister should be careful that bee-farming, which is successfully carried on in this district, under conditions in regard to suitable bee pasturage nowhere excelled in the State, shall not be exterminated. Mr. Bolton was the pioneer of the Upper Glenelg for bee-farming, and has now 384 colonies of bees near Glen Isla; and Messrs. Payne, Stevenson, Gaston, Kearns Bros., Fisher, Wormsley, Young, Scullian, McDonald, Ballinger, Russell, and Bassett, have each entered upon the industry, and have a number of colonies established in the neighbourhood.

The district is covered with a forest of eucalypts, composed of yellow box, the finest of all the native trees for honey-yielding blossom, white ironbark, redgum, grey box, stringy-bark, messmate, manna gum, peppermint, and bastard-box. The honey season begins in October, and often lasts till May, when the grey box blooms.

A recent interview with Mr. Bolton, whose distributing centre has been established at Dunkeld, afforded some interesting information on the value of this fine honey district to the bee-keeper. The following extract from his books and income tax returns reveals at a glance what a well-managed bee-farm can produce in a district where there is abundant bee pasturage:—

Season.	Spring Count Colonies.	Swarms.	Honey Yields.	Value.	Wax.	Value.
			lb.	£	lb.	£
1898 ...	100	260	33,400	559	173	12
1899 ...	223	245	2,960	58	244	13
1900 ...	310	439	67,362	1,127	628	36
1901 ...	329	409	11,267	203	245	14
1902 ...	384	448	80,000	1,200	1,100	64
			194,989	3,147	2,390	139

Thus the average annual gross value of honey and wax for the five years amounts to the surprising sum of £656 16s., a record that may well challenge Australia to beat. The bees (together with the requisite buildings) which produced this annual income occupy about two acres of standing room, and gather over six square miles of virgin forest.

Mr. Bolton is an English engineer, who came out to Australia some years ago for the benefit of his health, took up bee-keeping as a hobby, and met with indifferent success until he discovered the special value of the Upper Glenelg District for honey production. Mr. Bolton's knowledge of mechanics has enabled him to introduce a number of labour-saving appliances into the honey room and apiary. A steam plant drives the honey-extractor, heats the honey, and refines down each day's cappings into pure cakes of beeswax ready for the market. The honey is run into settling tanks holding two and a-half tons each, which can be heated with steam coils, so that the honey can be drawn off readily into the retail jars and tins in which it is sent out for distribution. He uses the Heddon hive, modified with his own improvement, which enables swarming to be easily controlled by the apiarist, and his bees are Cyprians, crossed by Ligurians. They are good workers, and shake out readily when artificial swarming is practised. Foul brood, the scourge of bee-keeping, has never given him trouble, and he attributes this to the presence of the Cypria cross and the free use of napthaline in the hives.

Mr. Bolton states that in good country like the Upper Glenelg, one man, with a little assistance in the spring, during the swarming period, can look after and manage 150 colonies.

The members of the Bee-keepers' Association are enthusiastic advocates for forest preservation, and have approached more than one Minister for Lands with a proposal to make prominent members of their association honorary foresters, pointing out that it is the business of the apiarist to learn much about the native flora that would enable him to be of service in helping to guard the forest from ruthless destruction. It is to be hoped that the honey value of the forest of the Upper Glenelg district will not be lost sight of when the Blue Blocks are thrown open for selection.—The *Argus* (Melbourne).

LUCERNE RECORD FEEDING QUALITIES.

When, on the occasion of a Show banquet at Forbes, New South Wales, Mr. N. A. Gatenby, of Jemalong, made the assertion that he had fed 15,000 sheep from 200 acres of irrigated lucerne for a period of three months his statement was received with a mild chorus of derision from his fellow-squatters, and also from some not very well-informed newspaper critics. One of the latter said that "nothing of the kind had ever before been heard of in the world. It would mean 75 sheep per acre . . . . on which space such a number would hardly have room to move about and feed; there would be only the produce of eight yards by eight for each sheep." The Minister of Agriculture, who was present at the banquet, was greatly interested in what Mr. Gatenby said, and in the correspondence which subsequently took place the latter offered to prove his statement by sustaining without deterioration, for four months, 75 sheep for each acre of lucerne. The Minister instructed Inspector Dunnicliff to proceed to Jemalong and supervise the experiment. In October last a paddock of lucerne, 22½ acres in extent, was handed over to the inspector, and sheep to the number of 1,685, some of them so weak as to be scarcely able to walk, were placed in a paddock quite bare of feed, where they were fed twice a day with lucerne cut and carted to them. Only one sheep died during the four months over which the experiment lasted, and, when it is remembered that the sheep were really "starvers," it must be admitted that Mr. Gatenby's statement has been triumphantly vindicated. There was no rule of thumb about the experiment. The acreage was measured, the sheep counted, and the whole of the work carried out by a responsible Government officer, who vouches for the correctness of the results. There are hundreds of thousands of acres of irrigable land in Victoria splendidly adapted for lucerne growing. When is the example of Mr. Gatenby going to be imitated?

The confidence which Mr. Gatenby has in the great value of lucerne in times of drought is not based alone on the experiments referred to above. On 1st February, during the drought of 1900, he commenced to feed 8,000 sheep from 120 acres of irrigated lucerne, and he fed them entirely from that area during February, March, and April, and ceasing to feed the first week in May. The newspaper critic previously mentioned remarked :—"The date and banana trees have always been reckoned able to yield more food than any other plant in proportion to the space they occupy; but even if sheep ate dates and bananas—which they might do during the present drought—the story would be incredible." Mr. Gatenby very pertinently points out that dates and bananas, like wheat and oats, have their one crop and are done for the season, but irrigated lucerne can be cut once a month, and seven or eight crops a year obtained. To feed the 8,000 sheep in 1900, an area of six or seven acres was cut each day. The wagons and carts took it to the sheep, which were in small paddocks in lots of about 800 each, and, although they did not get as much as they could eat, they got enough to save their lives. In a letter to *The Australasian*, which appeared on 20th September, Mr. Gatenby, in dealing with the criticism to which his statement had been subjected, says :—"Taking the figures as supplied, eight yards by eight for each sheep=64 square yards, suppose you can cut the lucerne once in 32 days, it means that you can cut two square yards of green-fodder, 18in. to 2ft. in height, for each sheep daily. Can anyone doubt that this is not sufficient to save a sheep's life? In 1900 I cut the lucerne twice for ensilage, twice for hay, and three times for sheep-feeding, one paddock being cut the eighth and last time early in May, and then discontinued, as the rain gave sufficient food. Of course, the May cutting was practically April's growth, as lucerne will not grow here in the winter."—*Exchange.*

GARDEN NOTES FOR MAY.

By Percy G. Wicken.

The month of May brings us into the winter, and the weather being cool and the autumn rains having started, garden work should be in full swing. Heaps of manure that have accumulated during the summer months should now be turned over and dug into the ground as early as possible. Those who have taken the trouble to make a compost heap of all the rubbish and manure about the house during the dry weather, will now have a nice stack of manure for use in the garden. All ashes and house refuse should be put on this heap, as they contain a fair percentage of potash. This manure should be spread evenly on the surface and dug in with a spade, or else turned under with a prong hoe or a digging fork. It is an advantage to leave the ground in a rough state for a time after this digging up to allow it to sweeten. A great proportion of the work in gardens is carried out by hand labour, but where the area is large, much labour may be saved by the use of the Planet Junr. hand seed drill and hand cultivators. These small implements enable the garden work to be performed with much less labour and a saving of time. For those who cultivate a larger area, a number of small garden implements are made, which can be worked by one light horse, and will enable gardeners to keep the surface soil well worked at very little expense. The wet weather will soon be at hand, and attention will require to be given to the question of draining, or carrying off the surplus water from the land. This can either be done by surface drains, or by a system of sub-draining. The sub-drains are by far the best system, as they do not interfere with the working of the surface soil. Sub-drains can either be laid down with hardwood slabs, stones, or burnt clay tiles. The tile drains are by far the best, and when once put down are almost everlasting. Stagnant water must be removed from the soil if satisfactory crops are to be obtained. Those who have to use artificial manures in the garden should not put them too deep in the soil, otherwise they are lost before the plants can take them up; they are better applied on the surface and then raked in.

Asparagus.—It is not necessary to plant this out until the spring, but the ground takes some time to prepare, and should be got in readiness as opportunity offers. A trench should be dug about two feet deep, the top soil being placed on one side, and the lower soil on the other. This enables the soil to be placed back in the same way as taken out, and not leave the sour soil on the surface. Mix in with the soil in the trench a liberal supply of well-rotted stable manure, and you are ready for planting when necessary.

Beans, Broad.—These may be sown largely this month. They should be sown in drills from one to four feet apart, according as to whether they are dwarf or tall varieties, and from three to four inches apart in the drills.

Beans, French.—A few can be sown where there is no danger of frost, in the very warm districts.

Brussel Sprouts.—These are a very wholesome vegetable, and should be grown by everyone for home use. They make a very welcome addition to the table. Seed may now be sown in a seed bed, and when the plants are large enough plant out about two feet apart in well prepared soil.

Cabbage.—Sow a small quantity of seed as required, so as to keep up a supply of young plants, and plant out any young plants that you may have; only healthy young plants should be transplanted; those too old or spindly will not prove profitable.

Cauliflower.—Plant out from seed bed in rows three feet apart and 18 inches apart in drills, and sow more seed for future planting.

Carrot.—Sow a plentiful supply for home use, a surplus supply will be appreciated by the farm horses. The Early Shorthorn is a good variety to grow.

Celery.—Plant out in a well-manured trench any young plants that you may have available.

Leeks.—Sow largely of this wholesome plant, and plant out any young plants that you may have ready.

Lettuce.—Sow sufficient seed to meet your future wants, and plant out any plants you may have on hand.

Onion.—Plentiful supplies of this healthy vegetable can now be sown; they are always useful. The surface soil requires to be brought to a very fine tilth. The seed may either be sown direct in drills, and thinned out later on, or they may be planted in beds, and the young plants pricked out when ready; the latter way is more tedious, but prevents the young plants from being smothered in weeds when very small, the transplanted plants have a start on the weeds, and, therefore, make a quicker growth.

Parsnip.—Seed of this vegetable may be sown; the ground requires to be dug deeply, and no fresh manure should be applied to the crop.

Peas.—If you have not enough already sown, sow as many as possible; a plentiful supply of green peas is always welcome. Climbing varieties should be staked as early as possible, and the soil kept well worked between the rows. Do not apply nitrogenous manures to this crop: superphosphate and sulphate of potash, and a liberal supply of lime are required.

Turnips.—A few rows may be sown to keep up a succession.

Farm.—The principal operations during the month will be ploughing, and sowing of the wheat crops. The earlier the wheat can be sown the better the results that are likely to be obtained. All available teams will be at work cultivating the soil, and other work will have to remain until the crop is sown. All wheat should be pickled in a solution of bluestone (1lb. to five gallons of water) before sowing; or, as a substitute, may be dipped in hot water at a temperature of 132deg. for two minutes. This will destroy all smut spores. The earlier the crop is sown the smaller quantity of seed per acre need be used. As the sowing takes place later in the season a greater quantity of seed is required, as the plants do not get the same opportunity of stooling out as those sown earlier. It is the intention of this Department to carry out some experimental plots at Newcastle, Northam, York, and Narrogin during this season. A number of varieties of wheat and manurial tests will be carried out, and placards will be placed on each plot. Further particulars will be published in the next issue, and it is hoped that settlers in these districts will take notes and study the results from the plots. In addition to this, all settlers should carry out a number of experiments for themselves, and communicate the results to the members of their Agricultural Associations at their meetings, when they can compare notes and discuss the results.

Orchardists should be busy during the month, as the pruning season is approaching, and all pruning tools should be got in order and the necessary arrangements made for pruning the orchard and vineyard during the coming month. A sharp look out should be kept for insect pests, and all trees should be given a winter application of one of the various insecticides. If in doubt as to the identity of any insect pests, forward specimens to the Department of Agriculture, and full information will be supplied.

THE CLIMATE OF WESTERN AUSTRALIA DURING MARCH, 1903.

This was the coolest March on record in Perth. The mean of the daily maxima was only 76·8 at the Observatory and 79·3 in the Perth Botanical Gardens, or about five degrees below the average for previous years. At the Observatory it was lower even than in Melbourne, where, however, it happened to be warmer than usual. It will be interesting to remember that last March was one of the hottest ever experienced.

The temperature was below the average almost throughout the entire State, except in the far North, especially the interior, where Marble Bar recorded a mean maximum of 104·0 and Nullagine 101·0, the average for previous years at the latter place being only 93·9.

The rainfall was very light throughout the greater portion of the State. It was about an average on the South coast. In the tropics it was very patchy, some places, especially near Cossack, receiving an unusually heavy downpour, whilst others had scarcely any.

The Climate of Western Australia during March, 1903.

	Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
		Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	March, 1903.					* Average for previous Years.				Points (100 to inch) in Month.	Total Points since Jan. 1.
						Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.		
North-West and North Coast:	Wyndham ...	29·745	29·806	29·947	29·597	95·8	79·9	87·8	102·0	70·0	94·5	77·9	104·2	70·0	950	4265
	Derby	29·788	29·834	29·945	29·701	95·2	...	...	100·8	73·8	95·6	76·5	105·0	64·0	128	1345
	Broome ...	29·792	29·814	29·924	29·708	92·9	79·7	86·3	99·8	72·0	92·9	76·3	102·5	62·8	601	983
	Condon ...	29·800	29·847	29·908	29·562	94·5	75·0	84·8	103·4	70·0	92·8	73·6	103·8	56·5	197	422
	Cossack ...	29·793	29·826	29·902	29·623	96·6	75·4	86·0	104·8	69·2	96·0	76·7	111·2	65·0	338	789
	Onslow ...	29·805	29·834	29·950	29·680	97·0	72·0	84·5	112·0	65·0	96·6	74·0	112·0	63·0	Nil	246
	Carnarvon ...	...	29·899	...	...	86·6	66·3	76·4	102·2	60·2	90·4	70·7	110·3	56·0	Nil	16
	Hamelin Pool...	29·890	29·890	30·041	29·729	93·3	62·7	78·0	103·0	55·0	95·5	67·6	112·8	50·6	Nil	Nil
	Geraldton ...	29·985	29·974	30·150	29·800	80·4	60·0	70·2	99·0	49·0	84·0	62·4	107·0	50·1	Nil	43
Inland:	Hall's Creek ...	29·795	29·891	29·973	...	95·0	73·7	84·4	104·0	65·0	93·1	73·5	102·0	54·8	616	2657
	Marble Bar ...	...	...	...	...	104·0	78·0	91·0	111·0	71·0	...	...	...	...	51	477
	Nullagine ...	29·788	29·884	30·033	29·611	101·0	72·8	86·9	110·0	62·2	93·9	69·8	108·5	54·9	45	234
	Peak Hill ...	29·850	29·886	30·110	29·580	97·0	68·0	82·5	102·0	59·0	92·4	69·4	102·8	52·8	29	63
	Wiluna ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Cue	...	29·916	...	...	...	...	...	...	...	94·4	67·0	108·2	49·5	...	...
	Yalgoo ...	29·870	29·926	30·180	29·630	90·0	58·0	74·0	100·0	53·0	92·2	65·0	107·7	48·6	Nil	76
	Lawlers ...	29·891	29·944	30·200	29·670	89·1	63·3	76·2	101·8	50·4	89·7	65·5	105·1	46·8	32	297
	Laverton ...	29·938	...	30·288	29·638	87·3	61·7	74·5	102·0	52·3	...	...	...	...	265	1400
	Menzies ...	29·925	29·981	30·300	29·700	86 1	60·0	73·0	100·2	49·6	87·6	62·1	105·0	46·0	66	463
	Kalgoorlie ...	29·956	30·014	30·344	29·590	84·3	57·5	70·9	101·6	45·2	86·2	60·1	104·0	43·8	7	32
	Coolgardie ...	29·945	30·006	30·330	29·600	84·7	57·1	70·9	100·3	43·2	86·2	58·8	104·2	45·0	Nil	62
	Southern Cross	29·965	...	30·280	29·640	87·2	53·4	70·3	101·0	40·0	87.6	57·4	105·6	40·0	Nil	70
	Walebing ...	...	...	...	...	83·1	54·3	68·7	97·8	45·0	...	...	...	...	8	216
	Northam ...	...	...	...	...	85·0	53·8	69·4	99·0	42·0	...	...	...	...	6	51
	York	29·990	30·013	30·330	29·720	83·2	52·2	67·7	99 0	40·4	87·0	55·6	105·2	41·5	Nil	35
	Guildford ...	...	...	...	...	81·3	52·2	66·8	100·0	41·8	...	...	...	. .	23	34

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Climate of Western Australia during March, 1903—*continued.*

	Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
						March, 1903.					* Average for previous Years.					
		Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast:	Perth Gardens ...	30·030	30·028	30·316	29·814	79·3	56·4	67·8	97·4	45·6	84·6	60·8	106·2	46·0	28	30
	Perth Observatory	30·035	30·021	30·318	29·819	76·8	56·7	66·8	97·6	45·8	81·6	60·6	103·7	45·9	20	22
	Fremantle ...	...	29·994	...	...	73·6	58·8	66·2	93·0	48·5	78·6	62·0	99·8	48·6	36	44
	Rottnest ...	30·034	29·988	30·303	29·812	72·4	60·1	66·2	91·0	52·0	76·6	63·5	95·0	52·2	13	15
	Mandurah ...	...	...	...	...	76·7	52·2	64·4	92·0	39·0	...	...	...	...	24	41
	Wandering ...	...	...	...	...	78·5	46·0	62·2	94·0	30·8	...	...	...	...	14	23
	Collie	...	...	...	...	77·3	44·4	60·8	95·1	34·5	...	..	...	...	38	61
	Donnybrook ...	...	...	...	...	77·3	47·4	62·4	95·3	35·9	...	...	...	...	23	26
	Bunbury ...	30·045	30·045	30·370	29·770	73·9	50·6	62·2	89·2	39·8	79·2	56·3	96·5	40·2	35	41
	Busselton ...	...	...	...	...	74·3	47·7	61·0	86·9	36·5	...	...	...	...	42	52
	Bridgetown ...	...	...	...	...	76·9	43·0	60·0	92·9	31·0	...	...	...	...	43	51
	Karridale ...	30·000	30·063	30·290	29·700	73·7	52·2	63·0	93·5	41·0	74·5	54·6	101·5	39·0	116	160
	Cape Leeuwin ...	30·015	30·030	30·330	29·650	71·7	59·6	65·6	90·5	51·9	71·8	61·0	91·0	50·5	67	88
	Katanning ...	30·000	30·032	30·330	29·680	78·6	48·2	63·4	95·0	38·2	80·8	51·4	103·0	35·0	13	24
	Albany	30·016	30·057	30·373	29·649	71·1	50·7	60·9	94·9	38·0	72·0	55·5	98·4	41·4	114	140
	Breaksea... ...	30·010	30·058	30·370	29·610	68·0	56·1	62·0	88·0	48·8	68·7	58·7	93·0	48·0	83	113
	Esperance ...	29·995	30·064	30·330	29·640	75·0	55·0	65·0	95·0	44·0	77·0	57·0	104·4	40·6	123	172
	Balladonia ...	...	...	...	...	80·9	51·4	66·2	97·2	39·5	...	...	...	...	Nil	39
	Eyre	29·994	30·070	..	...	76·6	56·9	66·8	98·0	42·2	77·8	56·4	105·0	38·2	101	119
						INTER-STATE.										
	Perth	30·035	30·021	30·318	29·819	76·8	56·7	66·8	97·6	45·8	81·6	60·6	103·7	45·9	20	...
	Adelaide	30·000	30·068	30·337	29·550	79·2	59·0	69·1	97·5	46·9	81·4	59·2	108·0	44·8	220	...
	Melbourne	29·971	29·966	30·353	29·535	77·1	54·4	65·8	99·8	43·2	74·7	54·6	105·5	37·1	293	...
	Sydney	30·070	30·055	30·370	...	78·0	67·0	72·5	94·0	59·0	75·4	63·1	102·6	48·8	37·8	...

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected except in the case of the Perth Botanical Gardens.

The Observatory, Perth,
8th April, 1903.

W. E. COOKE,

RAINFALL for February, 1903 (completed as far as possible), and for March, 1903 (principally from Telegraphic Reports).

STATIONS.	FEBRUARY.		MARCH.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
EAST KIMBERLEY:				
Wyndham	491	13	950	12
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Denham	552	4	...	..
Rosewood Downs	...	...	...	...
Argyle Downs	608	12	...	...
Lisadell	...	...	...	...
Turkey Creek	1033	16	765	9
Plympton, St. Mary	934	...	...	...
Koojubrin	...	...	...	...
Hall's Creek	344	...	616	10
Flora Valley	...	...	...	...
Ruby Creek	...	...	...	...
Denison Downs	...	...	...	...
WEST KIMBERLEY:				
Obagama	...	...	...	...
Beagle Bay	963	13	...	...
Derby	870	12	128	5
Yeeda	431	9	...	...
Liveringa	...	...	...	...
Mt. Anderson	...	...	...	...
Leopold Downs	...	...	...	...
Fitzroy Crossing	814	13	76	6
Fitzroy (C. Blythe)	...	...	...	...
Quanbun	...	...	...	...
Nookanbah	...	...	...	...
Broome	299	6	601	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay	228	8	366	8
NORTH-WEST:				
Wallal	192	6	143	3
Condon	225	3	197	1
De Grey River	297	3	...	...
Port Hedland	209	4	595	3
Boodarie	150	3	...	...
Yule River	...	...	...	...
Warralong	432	7	...	...
Muccan	396	8	...	...
Ettrick	587	7	...	...
Mulgie	310	5	...	...
Eel Creek	269	...	...	...
Pilbarra	326	5	576	2
NORTH-WEST—*cont.*				
Coongon	376	5	...	...
Warrawagine	171	5	...	...
Bamboo Creek	180	6	85	1
Marble Bar	377	8	51	1
Warrawoona	337	7	28	...
Corunna Downs	128	5	...	...
Nullagine	155	7	45	1
Tambourah	...	...	...	...
Kerdiadary	341	10	...	...
Roy Hill	155	5	...	...
Mosquito Creek	131	5	...	...
Mulga Downs	333	7	...	...
Woodstock	158	6	...	...
Mt. Florence	446	5	...	...
Tambrey	500	10		...
Millstream	694	8	...	...
Yandyarra	...	...	...	...
Mallina	412	3	...	...
Whim Creek	546	5	1075	3
Cooyapooya	594	4	...	...
Woodbrooke	569	3	...	...
Croydon	637	12	...	...
Balla Balla	560	4	455	2
Roebourne	409	5	423	3
Cossack	451	4	338	3
Fortescue	381	3	6	1
Mardie	255	3	...	...
Mt. Stewart	266	7	...	...
Yarraloola	131	4	...	...
Chinginarra	375	3	..	...
Onslow	246	6	Nil	...
Peedamullah	178	8	...	...
Red Hill	310	4	...	...
Mt. Mortimer	49	4	...	...
Wogoola	...	...	...	...
Nanutarra	...	...	...	...
Yanrey	155	...	...	...
Point Cloates	...	...	...	...
GASCOYNE:				
Winning Pool	167	5	Nil	...
Towara	72	3	...	...
Ullawarra	40	1	..	...
Maroonah	...	...	...	...
Gifford Creek	...	...	...	...
Bangemall	88	3	...	...

RAINFALL—*continued.*

STATIONS.	FEBRUARY. No. of points. 100 = 1in.	FEBRUARY. No. of wet days.	MARCH. No. of points. 100 = 1in.	MARCH. No. of wet days.
GASCOYNE—*contd.*				
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	...	...	...	...
Yanyeareddy ...	56	2	...	...
Williambury ...	37	1	...	...
Wandagee ...	54	3	...	...
Bernier Island ...	75	3	...	...
Boolathana ...	13	2	...	...
Carnarvon ...	16	2	Nil	...
Cooralya... ...	...	...	...	...
Doorawarrah ...	...	...	...	...
Mungarra ...	16	1	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	...	...	...	...
Upper Clifton Downs	25	1	...	...
Errivilla... ...	...	...	...	...
Dirk Hartog Island	61	3	...	...
Sharks Bay ...	19	3	...	...
Kararang ...	110	3	...	...
Meedo	19	2	...	...
Tamala	23	1	...	...
Wooramel ...	Nil	...	Nil	...
Hamelin Pool ...	Nil	...	Nil	...
Byro	2	1	...	...
Yarra Yarra ...	2	1	...	...
Berringarra ...	6	1	...	...
Mt. Gould ...	...	...	...	...
Wandary... ...	25	2	...	...
Peak Hill ...	31	4	29	1
Horseshoe ...	33	5	...	...
Mt. Fraser ...	71	2	...	...
Abbotts	87	3	Nil	...
Meekatharra ...	56	2	...	...
Belele	...	...	...	...
Mileura	16	1	...	...
Milly Milly ...	9	1	...	...
Manfred ...	Nil	...	...	...
New Forest ...	...	...	...	...
Boolardy ...	Nil	...	...	...
Billabalong ...	Nil	...	...	...
Wooleane ...	Nil	...	...	...
Murgoo	29	2	...	...
Meeka	9	2	...	...
Mt. Wittenoom ...	30	2	...	...
Nannine	27	2	7	1
Star of the East...	31	2	5	1
Annean	37	2	...	...
Tuckanarra ...	23	1	28	1

STATIONS.	FEBRUARY. No. of points. 100 = 1in.	FEBRUARY. No. of wet days.	MARCH. No. of points. 100 = 1in.	MARCH. No. of wet days.
GASCOYNE—*contd.*				
Coodardy ...	Nil	...	20	1
Cue	21	3	14	1
Day Dawn ...	6	2	Nil	...
Lake Austin ...	22	3	Nil	...
Lennonville ...	288	6	Nil	...
Mt. Magnet ...	203	5	7	1
Warracoothara...	149	5	...	...
Challa	88	3	...	...
Youeragabbie ...	9	1	...	...
Burnerbinmah ...	2	1	...	...
Barnong... ...	66	4	...	...
Yalgoo	76	3	Nil	...
Gabyon	22	1	...	...
Wurarga ...	39	1	...	...
Gullewa	16	2	...	...
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	8	1	Nil	...
Mt. View ...	6	1	...	...
Mumby	24	2	3	1
Yuin	...	...	...	...
Northampton ...	15	1	Nil	...
Mt. Erin ...	104	3	Nil	...
Oakabella ...	120	2	...	...
Narra Tarra ...	90	2	Nil	...
Tibradden ...	58	2	Nil	...
Sand Springs ...	86	1	Nil	...
Mullewa... ...	16	3	Nil	...
Kockatea ...	24	2	...	...
Bootenal ...	64	1	...	...
Geraldton ...	43	4	Nil	...
Greenough ...	20	1	Nil	...
Dongara ...	39	1	Nil	...
Dongara (Pearse)	36	1	Nil	...
Strawberry ...	33	1	...	...
Mingenew ...	10	2	1	1
Mingah ...	34	1	...	...
Yandenooka ...	...	...	Nil	...
Rothesay ...	50	3	...	...
Carnamah ...	109	4	5	1
Watheroo ...	190	5	3	2
Dandaragan ...	104	5	13	2
Moora	171	5	Nil	...
Yatheroo ...	...	...	...	...
Walebing ...	207	5	8	1
New Norcia ...	70	5	8	2

RAINFALL—*continued.*

Stations.	February.		March.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	12	2	12	1
Belvoir	Nil	...	25	4
Mundaring	Nil	...	38	3
Guildford	Nil	...	23	5
Canning W't'r'w'ks	Nil	...	29	3
Perth Gardens	Nil	...	28	7
Perth Observatory	Nil	...	20	5
Subiaco	Nil	...	26	5
Claremont	Nil	...	23	5
Fremantle	Nil	...	36	7
Rottnest	Nil	...	13	8
Armadale	Nil	..	...	...
Rockingham	Nil	...	35	4
Canning River	Nil	...	13	...
Jarrahdale	Nil	...	27	3
Mandurah	Nil	...	24	6
Pinjarra	Nil	...	48	3
Yarloop	Nil	...	52	5
Harvey	Nil	...	34	4
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley	74	4	5	1
Momberkine	20	3	...	...
Monglin	23	4	7	1
Culham	...	...	...	...
Newcastle	2	1	Nil	...
Eumalga	30	2	6	1
Northam	45	1	6	1
Grass Valley	66	1	5	1
Meckering	91	2	1	1
Cunderdin	...	...	...	...
Codg-Codgen	89	5	5	1
Jarragin	158	5	...	...
Doongin	146	3	...	...
Cuttenning	38	3	13	1
Whitehaven	28	3	8	3
Sunset Hills	3	1	8	1
Cobham	19	2	10	2
York	35	1	Nil	...
Beverley	Nil	...	2	2
Barrington	Nil	...	...	...
Stock Hill	Nil	...	Nil	...
Sunning Hill	Nil	...	Nil	...
Wandering	Nil	...	14	3
SOUTH-WEST—*contd.*				
Pingelly	Nil	...	3	1
Marradong	Nil	...	19	4
Bannister	Nil	...	23	4
Narrogin	Nil	...	10	2
Wickepin	Nil	...	10	4
Gillimaning	Nil	...	...	...
Bunking	Nil	...	32	3
Bullock Hills	Nil	...	...	...
SOUTH-WEST DIVISION (SOUTHERN PART):				
Bunbury	Nil	...	35	...
Collie	Nil	...	38	6
Salvation Army Settlement	Nil	...	32	4
Glen Mervyn	Nil	...	42	5
Dardanup	Nil	...	36	5
Donnybrook	Nil	...	23	3
Boyanup	Nil	...	26	3
Ferndale	Nil	...	42	3
Busselton	Nil	...	42	7
Margaret River	...	...	...	...
Lower Blackwood	Nil	...	...	...
Karridale	3	1	116	13
Cape Leeuwin	Nil	...	67	17
Biddellia	6	2	...	...
Lake Muir	1	1	...	...
Mordalup	3	3	79	9
Deeside	Nil	...	...	...
Balbarup	Nil	...	...	...
Wilgarup	Nil	...	100	6
Mandalup	Nil	...	38	5
Bridgetown	Nil	...	43	6
Westbourne	...	...	69	8
Greenbushes	Nil	...	45	5
Greenfields	Nil	...	...	...
Glenorchy	Nil	...	20	3
Williams	Nil	...	20	5
Arthur	Nil	..	11	1
Darkan	Nil	....	6	1
Wagin	Nil	...	15	3
Glencoe	Nil	...	16	3
Dyliabing	Nil	...	19	1
Katanning	Nil	...	13	3
Kojonup	Nil	...	52	5
Broomehill	Nil	...	18	3
Sunnyside	Nil	...	29	5
Woodyarrup	Nil	...	...	...

RAINFALL—*continued.*

Stations.	February.		March.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West—*contd.*				
Blackwattle ...	...	...	...	...
Mt. Barker ...	3	1	108	10
Kendenup ...	Nil	...	44	6
St. Werburgh's...	4	2	...	...
Forest Hill ...	6	2	150	14
Denmark ...	32	3	...	...
Grasmere ...	10	4	154	12
Albany	2	2	150	14
Point King ...	5	1	98	9
Breaksea ...	6	1	83	15
Wattle Hill ...	31	3	207	12
Cape Riche ..	Nil	...	...	...
Pallinup ...	Nil	...	...	...
Bremer Bay ...	1	1	96	6
Jarramongup ...	...	...	...	...
Eastern Division:				
Lake Way ...	62	8	...	...
Gum Creek ...	87	4	...	..
Mt. Sir Samuel ...	142	3	30	2
Lawlers	248	7	32	1
Leinster G.M. ...	194	7	...	...
Lake Darlôt ...	162	6	...	...
Mt. Leonora ...	125	5	37	2
Mt. Malcolm ...	106	4	...	...
Mt. Morgans ...	136	4	120	2
Burtville ...	117	3	146	1
Laverton ...	113	3	265	...
Murrin Murrin...	110	3	33	2
The Granites ..	70	4	43	2
Tampa	55	3	...	...
Kookynie ...	167	3	60	1
Niagara	151	4	Nil	...
Yerilla	78	2	Nil	...
Edjudina ...	124	4	76	1
Menzies	217	5	66	...
Mulline	215	4	30	1
Waverley ...	179	3	Nil	...
Goongarrie ...	107	3	40	1
Mulwarrie ...	106	4	...	...
Kurawa	60	4	9	1
Kurnalpi ...	136	3	73	3
Bulong	31	2	Nil	...
Kanowna ...	74	3	8	1
Kalgoorlie ...	19	3	7	1

Stations.	February.		March.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Eastern—*contd.*				
Coolgardie ...	38	3	Nil	...
Burbanks P.O. ...	22	3	Nil	...
Burbanks Birthday Gift	...	..	...	...
Woolubar ...	42	2	...	...
Widgiemooltha...	46	2	Nil	...
50-Mile Tank ...	22	2	Nil	...
Waterdale ...	33	2	...	...
Norseman ...	25	2	Nil	...
Bulla Bulling ...	25	3	Nil	...
Woolgangie ...	...	...	Nil	...
Boorabbin ...	83	3	Nil	...
Karalee	85	1	5	...
Yellowdine ...	102	2	Nil	...
Southern Cross...	70	1	Nil	...
Mt. Jackson ...	140	4	Nil	...
Bodallin ...	82	1	...	...
Burracoppin ...	77	2	...	...
Kellerberrin ...	54	3	7	1
Mangowine ...	86	4	...	...
Wattoning ...	...	...	...	...
Eucla Division:				
Ravensthorpe ...	4	1	27	6
Coconarup ...	Nil	...	...	...
Hopetoun ...	Nil	...	69	6
Fanny's Cove ...	Nil	...	...	...
Park Farm ...	41	1	...	...
Esperance ...	32	2	123	7
Gibson's Soak ...	7	2	...	...
30-Mile Condenser	6	2	...	...
Swan Lagoon ...	21	4	...	...
Grass Patch ...	...	...	...	...
Myrup	32	1	...	...
Lynburn ...	35	1	...	...
Boyatup... ...	25	1	...	...
Point Malcolm ...	29	2	...	...
Israelite Bay ...	33	1	10	3
Bulbinia... ...	36	3	...	...
Frazer Range ...	9	1	...	...
Balladonia ...	19	1	Nil	...
Southern Hills ...	11	1	...	...
Eyre	11	1	101	4
Mundrabillia ...	29	2	...	...
Eucla	9	1	84	5

The Observatory, Perth,
7th April, 1903.

W. E. COOKE,
Government Astronomer

Return of Fruit imported into Western Australia during March, 1903.

NAME OF PORT.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomeloes.	Pines.	All other fruits.
FREMANTLE ...	4136	3418	718	718	1200	...	29	...	...	617	...	288	...	577	680	...	8	...	19
ALBANY	450	346	104	104	114	...	...	...	...	30	...	31	...	72	18	...	...	.	21
GERALDTON ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
ESPERANCE ...	20	20	...	...	8	...	..	...	...	2	...	...	...	4	2	...	...	...	4
TOTAL ...	4606	3784	822	822	1322	...	29	...	...	649	...	319	...	653	760	...	8	...	44

Department of Agriculture,
7th April, 1903.

Return of Fruit Trees and Plants imported into Western Australia during March, 1903.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.															
								Ornamental and Pot Plants	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	3	4600	3	4600	...		...	4600	...	...	...	...		...	...	...	...	...	...	...	...	...	...
Albany ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	3	4600	3	4600	...	...	...	4600	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Department of Agriculture,
7th April, 1903.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

NOTES.

APPLE EXPORTATION.—The Oruba, the nineteenth and last fruit boat of the season, sailed from Hobart on Saturday, April 25. The aggregate quantity of fruit sent home this year is 293,594 cases, compared with 300,000 last year.

TRANSVAAL IMPORTS.—The imports into the Transvaal for the ten months ended 31st October, 1902, included 2,320 cattle, 1,689 horses, 1,719 mules, 1,257 pigs, 146,433 poultry, and 1,586 sheep and goats. In the corresponding period in 1901 no cattle were imported, 14 horses, 14 mules, 338 pigs, and 34,699 poultry.

THE PRACTICAL MAN.—"'I'm a practical man, I am, and don't bother about readin'; they can't larn me anythin'." "You know the kind of man I mean," a correspondent writes, "and in buying cows I applied to a dairy farmer of this class in the vicinity, and was offered two, one a three-year-old Jersey cross for £5, and the other, a big Shorthorn, for £12. We looked over the two carefully, and asked what was the reason of his low price on the Jersey heifer. He replied, 'She is all right but she does not give milk enough.' 'How much does she give?' 'Oh, about 12 quarts a day.' 'Have you ever tested the milk?' 'No; I can't fool away my time testing cows.' 'How much milk does the big Shorthorn give?' 'Well, she will give 10 quarts twice a day, and I tell you she's a good one.' I concluded to buy the heifer, and afterwards found that it took only 15lb. of the little cow's milk to make 1lb. of butter. A test of the big cow showed that it required 33lb. to make 1lb. of butter. When I finally convinced the farmer that he had sold the most profitable cow in the herd for £5, all because he 'couldn't fool away his time testing cows,' he said he had to admit receiving new light on the subject."

GREEN MANURE FOR POTATOES.—There can be no doubt that many of the failures attending spring-sown potatoes in various districts of this State are due to the unsuitable condition of the soil in which some of the crops are sown. On some farms no definite attempt is ever made to grow potatoes. When a crop is to be put in, the land is made ready to-day and the sets are dropped in to-morrow, and that's the end of the matter until a boy is sent out to ridge them up with a plough. Some growers overlook the necessity for a moderate supply of potash altogether; and when others do think about the potash requirements, and add sufficient every time, they are disappointed by the meagreness of the crop. This, in nine cases out of ten, will be found, in spring-sown potatoes, to be due to want of humus in the soil; and until that want is made good, satisfactory spring crops of potatoes, or of anything else, will be unlikely. Unless the spring should be a wet one, or water should be available for irrigating, the use of stable manure at sowing time to form humus and supply small quantities of easily assimilable plant food is not likely to be attended with good results. What is really the best means of ensuring good spring crops of potatoes is to make the land ready several months in advance, by the sowing and turning under of some dense green crop, such as rape or rye.

Settling on the Land.—"From time to time," writes a correspondent in the *Age*, "we hear the question asked why our young men are leaving Victoria. I can give the reason why at least thirteen desirable Australian natives, with from £200 to £800 cash, have been compelled to leave their native land. Some few months ago myself and two others set off through Gippsland looking for land, but before going we went to the Lands Department to see what they had to offer, but they did not seem to know much about the subject there, so we decided to try private owners. We got particulars from agents of farms for sale, and on inspecting them we found the price ran from £5 to £25 per acre, the cheap land in all cases being very poor, hardly improved, long distances, and bad roads to the station. The dearer land is out of the question for poor men, as it would take at least £2,000 worth for a man with a family to make a living from, by paying £200 deposit and 5 per cent. on the balance, which are the terms owners were prepared to sell on. This practically means slavery for life, as we came across numbers of men who bought on those terms, taking bad years with good, who were working long hours and were just about able to pay interest. Is it any wonder men flock to the city when conditions like these are imposed if they want to live by farming? My friends decided that these terms would not suit them and went to Western Australia, and on inquiring at the Lands Department there they not only got full information but were driven over Crown lands at the expense of the Government. They selected land near Albany." [While it is pleasing to note that credit is given us to induce people to settle on our lands, ought it not to be remembered that not only are there more available lands to select from, but that our markets are much better than our less favoured sister States.—Ed. *Journal.*]

Bacteria in Soils.—The bacteria in soils theory is very fascinating (says a writer in the *Sydney Mail*), and claims many adherents among agricultural chemists. Its plain interpretation is that the greater the quantity of organic matter in a soil the greater the number of friendly bacteria engaged in converting the organic matter into nitrates which supply plant food; therefore if we supply the land with organic matter in the shape of stable manure we increase the bacteria, and their action sweetens the soil. It is held that it pays to make the available stable manure go as far as possible by spreading it out thinly and thus getting the bacteria to work over the greatest area that can be covered, while commercial fertilisers may be used to strengthen the land in between. An American writer says he regards his soil as a nitrate factory, and provides all the raw material he can for the busy operatives to work upon. Following this idea out it will be concluded that every bit of straw or other matter grown is valuable when turned into the "factory." The idea is interesting in connection with the large areas of our wheat land over which the stuff is used. The question of the best way to treat the stubbles of these crops comes up now and then. Some farmers advocate burning the stubbles, pointing out that this course saves trouble in the ploughing season, and contending that the slight value of the straw as a manure is best gained by burning and securing the residue in potash. Against this, others contend that the condition of the soil is vastly improved by the stubbles being ploughed in, and the bacterial theory certainly supports this view. Every wheat farmer must have noticed that land into which the stubbles have been worked is in better condition in the following season than that which has been swept clean by fire before ploughing.

POISON IN GREEN SORGHUM.—The numerous and serious losses of cattle that were fed on young sorghum in the United States have led to a number of careful and accurate field observations by the staff of the Nebraska Experiment Station. These observations have extended over three years, and the final report has not yet been published. Three years ago, Dr. A. T. Peters, animal pathologist at the station, who has had charge of the investigation, arrived at the conclusion that the animals did not choke to death, that they did not die of indigestion, but that they died from the effects of a poison which was elaborated in sorghums of stunted growth, and not from weeds, and that the symptoms were those of poisoning by prussic acid. The *Breeder's Gazette*, Chicago, of 12th November, 1902, gives a forecast of the nature of the report, from which I learn that it had been proved by analyses that sorghum, under certain conditions, developed a highly poisonous compound, and it was shown by chemical analysis that combined prussic acid was a normal constituent of all Nebraska sorghum, including Kaffir corn, and that no other forage plant contains this poison. The report will give evidence on which the following conclusions are based: "Young plants contain a larger quantity of combined prussic acid than more mature plants; second growth is not more dangerous than first growth; frost does not increase the amount of poison; drouth, by resisting development, tends to cause the plants to become highly dangerous; the danger increases as one goes Westward from the Missouri River (and this fact cannot be explained by lack of rainfall alone); reasons are given for believing that thoroughly-cured sorghum is harmless." Until more is known on this subject it will be well for stock-feeders and dairymen to refrain from growing sorghum as a green summer fodder for their stock.

AGRICULTURAL LECTURES.

By A. Despeissis.

TWENTY-FIRST LECTURE.

Buckwheat.

Although classed with corn crops, Buckwheat is not even a *graminea,* as its English name implies; it is not a wheat. Botanically it belongs to the *Polygoneae,* to which also rhubarb belongs. In appearance and properties these two plants differ widely.

This plant, which is a native of Manchuria, was, it is said, introduced into Europe by the Saracens, and brought to Western Europe by the Crusaders. In France it is called Sarrasin, and also sometimes Blé Noir, on account of the colour of its grain, which is dark. The English name "Buck Wheat" would seem to be derived from the German "*buch*" (beech), on account of the shape of its seeds, which are somewhat similar to the triangular seeds of the beech tree.

The plant is a succulent annual, with fibrous roots and herbaceous erect stems, which reach from one to two feet in height.

Of all cultivated plants it is one of the least exacting as regards soil and conditions, on that account a crop of great value for poor country, more especially those of granitic formation. Poor gravelly or sandy soils will carry it if drained, but it will not thrive on clay; nor does it seem very particular as regards climate. and is extensively cultivated in Brittany, Spain, and Italy, as well as in Sweden and Russia.

Buckwheat succeeds as well as a spring crop or as an autumn-sown one, where frosts are not severe. The ground should be deeply ploughed and well pulverised, and the seeds are sown if in drills at the rate of two pecks, and if broadcast one bushel per acre. For small patches the Planet Junior hand seed drill set, as for spinach seeds, answers very well.

The seeds, which are triangular, soon germinate, and if used for forage, the crop is ready for cutting within two months; when it begins to blossom.

This blossoming goes on successively without interruptions along the stalks of the same plant for a month or so, the plant carrying blossom as well as immature and mature grain at the same time. For this reason Buckwheat is considered an excellent bee food, while this peculiarity is a drawback to the grower who wants the seeds. These are easily shed.

After harvesting, which is done with a mower, the seeds are easily separated with a flail. An average yield varies from thirty to fourty bushels per acre on poor soil.

As the blossoms afford capital food for bees, so is the grain hard to surpass for the feeding of poultry. It is claimed that hens fed on Buckwheat lay much earlier in the spring, the grain like oats being possessed of certain exciting properties. For the same reason it is considered superior to maize for horses.

As the crop grown for grain is hard to harvest, owing to the free shedding of the seeds, the flock of fowls if turned into the buckwheat patch after harvest would find abundance of feed to pick, and whilst so engaged would not require any extra feeding.

On shooting reserves, it is largely sown for feed for game.

It is as nutritious as barley, but if given to cattle it should previously be deprived of its hard indigestible shell-like husk. When reduced to meal it is also used for feeding pigs.

Cut green for fodder two months after sowing, at blossoming time, an acre yields on an average some six tons of stuff, which is excellent for cattle, sheep, pigs, and horses. When dry it is reduced to a very small compass, and it does not pay to make hay of it.

Buckwheat is extensively used as an article of diet in Poland, Russia, Germany, Brittany, and other countries. It is there shelled by a small handmill made for the purpose. A sort of bread is made of it, which is dark in colour and does not rise so well as wheaten flour bread. It is also made into pancakes and pastry, which are very nutritious and easily digested, never causing any acidity in the stomach.

LEGUMINOUS CROPS.

These, regarded as food producers, are, next to cereals, the most extensively cultivated of our farm crops. In the ordinary diet of men and of animals, their usefulness does not so much consist as a substitute for cereals than as an adjunct to them.

The plants of the Leguminous order are either herbs (clover, vetches, beans, peas), shrubs (furze or gorse, broom, tree lucerne), or trees (acacia). Their botanical characteristics are distinct and typical of the order.

The leaves are usually compound, *i.e.*, made up of distinct leaflets. The flowers all show a marked family likeness, and, whether large as in the pea and bean, or small as in the clover head, they are all constructed on the one type, and consist of five petals, which in the papilonaceous flowers are very remarkable. These, on account of their peculiar arrangement, are called the standard, the wings, and the keel.

The "pods" or legumes which constitute the fruit are also in their organisation characteristic of the order. Another striking characteristic of plants of this order, and one which is not shared by plants of other botanical orders, is the peculiar power they possess of absorbing the free nitrogen of the air and fixing it into their tissues. In this, as we have previously seen, they are helped by symbiotic micro-organisms, which are located in wart-like growths on the roots of leguminous plants.

From the fact that leguminous plants are endowed with the property of absorbing the free nitrogen of the air, it follows that they are especially rich in nitrogenous ingredients, and for that reason constitute rich food.

"Legumin" is the peculiar nitrogen compound met with in beans and peas, and is equivalent to the "gluten" of the cereals.

Numerous experiments in feeding cattle have been recorded where leguminous grain or pulse have, in comparison with other substances, quite sustained the character of flesh formers which chemistry assigns to them.

For working animals of all sorts, pulse may be used very advantageously in their diet; the harder the work the larger the proportion of beans should be.

Those leguminous crops which are grown on the farm yield food grains (peas, beans, lentils), and are called pulses; and also forage stuff (the clovers, lucerne, sainfoin, vetches, lupins, furze, or gorse).

THE BEAN CROPS.

belong to the "Leguminosæ" and to the genus *Faba*, a word derived from a Greek word meaning "to eat."

Of beans there are many divisions:

(1.) The Field Bean (*Faba vulgaris arvensis*).

(2.) The Garden Bean (*Faba vulgaris hortensis*).

To the field bean belongs the Horse Bean, a very ordinary field bean in Scotland and the northern counties of England. It is very hardy and in good seasons very prolific. The stem is stout, from three to five feet in height, carrying its pods down to its middle; the pods containing usually three, but sometimes four and even five seeds. The average yield is taken at four quarters to the acre; the weight ranges from sixty to sixty-five pounds per bushel.

This variety is suitable for good, strong, well-drained clay or alluvial soils.

The Tick Beans are smaller varieties of the Horse Bean, and include the large ticks or negro beans, the small ticks, and the common variety.

The stems are shorter than those of the common Scotch or Horse Bean and measure three to four feet. These are the common field or horse beans of the South of England. They are much better suited for cultivation in the lighter class of bean soils and are more prolific varieties.

Winter Beans are very hardy varieties, which withstand the frosts of winter. They are sown in the autumn and harvested in the summer. A recommendation in Europe is its general freedom from the attacks of aphides, which very frequently destroy bean crops.

The straw or haulm is three to four feet high. It is well podded, has small seeds, very plump and heavy, which weigh from 65 to 70lbs. per bushel.

Field Beans are drilled or dibbed in rows 18 to 24 inches apart or broadcasted. The seed is deposited two to two and a-half inches below the surface according as it is spring or autumn bean.

A small machine is sometimes attached to the plough, which sows every alternate furrow. Dibbling is a slow and laborious process, and the work is expensive, but there is a considerable saving of seeds. The seeds come in 12 to 15 days after they are sown.

The flowering commences at the axils of the flower, and follows with the growth of the plant up to the top, the stem continuing its growth until the process of reproduction (maturing of its seeds) is completed.

By the time the crop is ready to be harvested for its seeds, the haulms are pretty well black. This bean straw is used for feeding, and is often mixed with pea haulm for the purpose. The harvesting is done before the haulms blacken too much if it is intended to use the crop for fodder, or until it is quite ripe if it is desired to secure the seeds.

The garden beans comprise the Broad Beans, which are grown for the sake of their unripe seeds, which, like green peas, are boiled for table use.

The Scarlet Runner Bean (Kidney Bean) with long twining stems and bold scarlet flowers is a native of Mexico, and is cultivated for the sake of its unripe pods, which are sliced and cooked, the part that is eaten being the immature ovary, or unripe seed.

The Dwarf French Beans, of which there are several varieties, some green-podded and others yellow-podded (Butter or Wax Beans).

Of the green-podded varieties the best known is "Canadian Wonder," 18 to 20 inches high, much branched; leaves large and coarse, flowers pink, pods very large and numerous, rather rough; beans large, nearly twice as long as broad, dark crimson, nearly black. The hardiest, strongest grower, and heaviest yielder of all.

Of the yellow-podded varieties the following are much liked:—"Yosemite Mammoth," plants 15 to 18 inches high, strong, much branched; leaves large, medium green; pods long, slightly curved, stringless, very succulent, and of a fine golden yellow colour; a very good table variety, nearly free from rust.

One important character of inferiority of the yellow-podded or butter beans over the green-podded varieties is, that the former are much more liable to "Bean Rust" than the latter.

Haricot Beans are a variety of French or Dwarf Beans. All these beans should be gathered while young and tender, unless it is desired to save the seeds, their bearing power being thus greatly increased.

The Lima Beans (*Phaseolus lunatus*) belong to another class which, unlike French Beans, and most of the pole beans, which are generally eaten while the seed pods are still tender, are used like the Broad Bean when shelled. Superior in flavour to broad beans and far more profitable.

Lima Beans, where the climate is mild and free from frost, are perennial in their growth, although in cooler localities where cut back by frosts they are annuals. They revel in heat and continue in bearing for a long time. Of Lima Beans, some are dwarf and others climbers.

The dwarf, of which the Bush Limas are the best, are planted in drills three feet apart with the seeds 18 inches in the rows. The seeds are placed two inches deep.

The Climber Lima receives the same treatment as other pole beans.

As a summer crop Limas are worthy of attention in our climate, as they will thrive in dry seasons when other beans fail.

The Soy Beans *(Soja Hispida)* are better suited for the warmer parts of the State. They are sown in the spring and occupy the land four and a half months.

Several varieties are grown, of which the Improved White is the best, the others suffering from "bean rust" rather severely.

The height of the plant reaches from two feet six inches to three feet six inches. The stalks are strong and woody with numerous branches covered with foliage. The stalks and branches are laden with clusters of hairy pods, which contain from one to three seeds each; generally two.

The plants may be fed to cattle when in flower, and are preferred to any other pulse, or the beans may be shelled out when quite green, when they form an excellent vegetable, and the plants stripped of pods are given to cattle to eat.

The Tonga Bean (*Dolichos Lablab*; variety, *Purpurens*). This bean also is very prolific, but is better adapted for green manuring than for the table. The flower stems and pods are purplish, the beans roundish oval, with a prominent white keel, by which they are attached to the pod, and are of a darkish brown colour.

The Mung Bean (*Phaseolus Mungo*) includes the Black and the Green grain of India. They are erect plants, 18 to 20 inches high, withstand drought well, and in the Northern Provinces of

India and Oudh, form a valuable food resource when millet fails, being highly esteemed and regarded as wholesome. It fetches the top price and is mostly bought by the richer classes, entering largely into delicate dishes and cakes. It is ruined by heavy rains during its flowering. In Australia the experiments conducted with the object of ascertaining its value have been highly satisfactory. The plants occupy the ground for about three months and seed heavily.

The seeds are small, and the straw not sufficiently abundant for fodder. In Western Australia it should be sown in the spring.

Beans are a typical crop for strong and heavy soils; indeed those soils which are best adapted for wheat, are equally suited for the cultivation of beans.

Although it may be successfully grown on the strongest clay soils, still a freer description of soil, such as the clay loam, are best suited to its habit of growth.

The chemical condition of the soil for beans, peas, and clover, are very different from those required by wheat.

Instead of the nitrogen, phosphoric acid, and silica required by that plant, the leguminous plants require lime, potash, and phosphoric acid, while the fallow or root crops, such as potatoes and turnips need mostly potash, phosphate, and nitrogen.

As the leguminous crops need less nitrogen than other crops, that most expensive constituent of any of our mixed manures, may be omitted when fertilising them.

TWENTY-SECOND LECTURE.

The Pea Crops.

Genus—*Pisum* of which there are two species.

(1.) *P. sativum arvense* (Field Peas, coloured flowers.)

(2.) *P. sativum hortense* (Garden Peas, white flowers.)

There are numerous varieties of both garden and field peas, with varying characteristics which render them suitable for different localities.

They are most profitable crops in themselves, and also afford a beneficial change to the soil. They require a somewhat moist climate, and for that reason are better suited to the coastal districts than to the somewhat dry inland districts of Western Australia.

They are good crops to grow on new land that has not been sufficiently well prepared to receive the ordinary farm and garden crops, because they come up readily in such, and are rather partial to a virgin soil.

Being good "food fossickers" they are also useful on worn out soils, and thus benefit succeeding crops. Moreover, they are useful for land fouled by weeds on account of the opportunity they offer to clean that land by repeated hoeings.

The pea, like the bean, delights in soils of a calcareous nature. Light loamy or marly soils rather partaking of the characters of the best barley soils are more suitable than heavy soils, which are better for wheat or beans.

On strong clays or soils very rich in vegetable mould, such as peat land, the growth is too luxuriant, and if the season be wet, the crop may be greatly damaged.

The roots are more fibrous than those of beans, which possess stronger tap roots.

The quantity of seeds sown varies from two to three bushels when drilled, and three to three and a-half when sown broadcast.

Sometimes the seeds, especially when old, are steeped for about 24 hours in water, to which some paraffin or petroleum oil is at times added, to keep off birds.

They are drilled at distances from 18 to 24 inches between the rows and deposited at about two inches below the surface, as mice and birds, pigeons especially, commit vast havoc if the seed is within reach of the surface.

The earlier sown the better. Peas require a finely prepared seed bed and should not be drilled when the soil is at all sticky.

May, June, and July are good months for sowing on the coast, but where there is a danger of frosts, sowing may be delayed till August.

Farmyard manure by itself, if properly applied directly to the crop, generally produces a too luxuriant growth of straw. An addition of superphosphate of lime or of bone dust to the farmyard manure at the rate of about 2cwts. to the acre, checking the luxuriant leafy growth and adding to the seed production.

In all cases it must be borne in mind that lime is a necessary ingredient in soils where beans and peas are grown.

Gypsum (sulphate of lime) is a very good form to apply it in, if it can be obtained at a suitable price, as the leguminous plants require both lime and sulphuric acid to complete their processes of growth.

As soon as the crop is up it is hoed and weeded. The flowering takes place irregularly as with the bean, the lower and more matured part of the stem bearing its flowers before the upper portion.

The crop is ready for harvesting six or eight weeks after the period of flowering has commenced.

It should not be allowed to ripen before being cut, or many of the pods burst and the peas fall out during the turnings to which it is necessary to subject them while they are in the field. It is sufficient that the haulm should be yellow, and the pods tough and also of a yellow colour.

In England and on the continent of Europe the cutting is done by machine or with a pea hook. If the peas are mown with the scythe, the pods are liable to be cut open or to be left on the ground on the uncut haulm. In Australia a more expeditious method of harvesting obtains, and consists in using the wooden pea-rake or in tearing the haulms with the horse-rake and gathering it in the same way as hay-making.

When cut or torn with a rake they are generally loosely rolled up in small bundles or "wads" and left lying in rows on the field. After these have become somewhat dried, the heaps must be turned over every day or every other day until they are fit for carrying; if not turned they become mouldy both in the middle and in the bottom of the wads, and both the straw and the seed are greatly deteriorated in value.

It is always desirable to stack peas on a stage, or on a raised frame of some sort, and also to insert some long poles in the centre or secure some other means of ventilation through the mass of the stack.

The sooner peas are threshed out the better. This is done with a flail on tarpaulins spread in the field, or by carting to the stackyard or barn and threshing by machine.

The yield varies more than for any other farm crop :—

15 bushels is a bad crop on a suitable soil.
30 bushels is a fair crop on a suitable soil.
60 bushels is a very good crop on a suitable soil.

The yield of straw is 1 to 1½ tons per acre. This crop is the most valuable we have for forage purposes if properly secured, but it is often spoilt by a certain quantity of sand. Pea haulm is particularly suitable when chaffed or steamed for dairy cows and ewes, while the seeds are good feed for horses and pigs.

Peas enter more largely into consumption as an article of food than beans; although their nutritive value is not superior, they are more palatable to the taste. For cattle feeding, peas are equally as valuable as beans.

Of "Field Peas" several varieties are cultivated. Their seeds are either white, dun, grey, or speckled.

Common Grey is a variety suitable for growing with beans, as, being a late one, it comes to maturity at about the same time. It is prolific when grown with beans, which keep the stems off the ground. The return is frequently very large. The haulm or straw makes excellent fodder for all description of stock.

Warwick Grey is the earliest of the grey variety, and comes to maturity a month earlier than the Common Grey.

Grant or Dutch Pea is more suitable for milder climates. The straw attains a length of 8 to 10 feet.

Winter Pea is chiefly met with in France and on the continent of Europe.

"Garden Peas" are sown from three to four feet apart for such sorts as Yorkshire Hero, and dwarf kinds from one and a half to two feet.

The first sowings take place during April or May, and from this to the end of the year are followed at intervals of a month or so.

Yorkshire Hero is a general favourite.

Among fruit trees, and when space is limited, such sorts as McLean's Little Gem and American Wonder may be planted in the autumn and early winter months. These should all make room for thorough cultivation before the end of the rainy season in August.

Other good sorts are Veitch's Perfection, Telegraph, Bliss's Abundance, etc.

Cow Pea *(Vigna catiang)*, of which there are several varieties, have won for themselves an enviable reputation in America, as well as in some localities in Australia, as a fodder plant, and also as a crop valuable for its manuring qualities.

It is a summer crop, and the seeds should not be sown until all danger of frost is over. It is a very desirable crop to grow on old worn out wheat lands to restore them to fertility, and should prove a favourite in the warmer districts of this State. The ground should be deeply ploughed and well pulverised; almost any soil will do. When sown in drills the lines are spaced three feet apart, and a pea is dropped every foot in the drills. When thus sown, 8 to 10 lbs. of seeds will do one acre; whereas if broadcasted, half to three-quarter bushels are required. Where drilled, the lines can be stirred with a horse hoe once or twice until the plants commence to cover the ground.

The crop sown in the spring ripens in midsummer.

If sown for green manuring, the vines should be ploughed in just after blossoming time and when the pods are forming. Amongst the best varieties are:—

The Black Cow-pea, which as regards usefulness heads the list, yielding a heavy crop of both green feed and dry pulse. The plant is hardy, leafy, and covered with long pods, well filled with peas, quite black, and larger than any of the other varieties.

Small White is the best for culinary purposes; the tender pods are cut up and served like French beans, while the seeds shelled out may be used in the same manner as green peas. A quick grower, with finer and longer stems and smaller leaves than the black variety.

Dun Coloured Cow-pea is a strong growing and hardy variety, with a climbing habit, but does also well on the ground. Inferior to the Small White for cooking.

Large White is the quickest grower of all, upright in habit, suitable for green manuring.

In the warmer Southern States of America, the Cow-pea is to the farmer what Red Clover is to the Northerner. It is extensively cultivated, used green as fodder for cattle, or cured into ensilage, and also ploughed in as green manure.

CHICK-PEA OR GRAM (*Cicer arietinum*).

This pulse is extensively used all over India and several hot countries for horse feed, in conjunction with bran, oats, or barley.

It stands hot dry weather better than do other varieties of peas, and should be very valuable in those districts too dry for maize.

The plant is a very quick grower, and on that account, as well also for the reason that it constitutes a rich fodder, it should prove useful as an autumn crop to supply fodder when all other feed is still scarce.

The seeds germinate rapidly, the leaves have a peculiar fern-like appearance, the plants blossom early, and mature their seeds within three months from sowing.

Two main varieties are cultivated, a red seeded one and a white seeded one, the one having pink flowers, whilst the other has pure white ones.

A good yield amounts to 20 to 30 bushels. Besides its extensive use as horse feed, gram constitutes excellent feed for poultry, and is also much used in India boiled or cured as pulse.

PIGEON PEA (*Cajanus indicus*) is an Indian shrub of great value in warm districts as fodder for cattle and horses, as well also as a palatable and nutritious pulse for human consumption. The pod is straight, from two to three inches long, and contains three to five seeds. The seeds, some of which are red and others variegated, should be planted in lines four or five feet apart. They germinate easily, and soon develop into leafy shrubs which, when they are covered with their yellow flowers, present a very striking appearance.

The shrubs, which are erect with tender branchlets, reach six to eight feet in height, and are perennial. They prefer a light but moist soil. In Mauritius they are extensively planted to recuperate fields worn out by the continuous and uninterrupted cultivation for a number of years of the sugar cane.

The tender seeds shelled out of the pods are considered a delicacy, and much liked by both coolies and planters; the shrubs are also valuable as fodder for cattle, which can be turned into the pigeon pea fields, whilst in places where firewood is scarce the stems of this shrub afford a valuable supply.

WAGNER'S FLAT PEA (*Lathyrus sylvestris*).

This pea was some years ago one of the most widely advertised leguminous plants in the European agricultural press, notably in Germany, and has proved, under the conditions which prevail in Australia, the most disappointing of all the leguminous crops cultivated.

The plant is a very slow grower; does not stand the blazing summer sun of Australia; yields a very poor fodder crop, and, generally speaking, has proved a failure.

In the Northern Provinces of India it is considered a cold weather crop, and is only grown on land unfitted for most other pulse.

The LENTIL (*Lens esculenta* or *Ervum lens*), is a branched annual with long leaflets. The pod is broad and short, and contains two seeds, which are compressed and have the form of a bi-convex lens.

The lentil does well on almost any soil, and is grown like peas as a cold weather crop. In India, where it is largely consumed, it is generally regarded as a pulse of the second class.

THE PEA-NUT OR EARTH-NUT (*Arachis hypogea*).

This is another annual leguminous plant which thrives to great perfection in Western Australia.

In Spain, Algeria, South America, and India its cultivation constitutes an important industry.

The nuts are graded, sacked, and sold in great quantities for eating, whilst an enormous amount is crushed in mills, where the oil (of which the nut contains over 40 per cent.) is extracted, and the residue compressed and sold for feeding stock.

The climate best suited for the cultivation of earth-nuts is one free from frost for about five months. The soil should be free and light to permit of the easy penetration of the flowering organs, which curve downwards into the ground, where they enlarge and ripen.

Like other plants of the pulse family, earth-nuts need lime in the soil, otherwise the crop is not worth growing.

Two chief varieties are grown—a white and a red one.

The white nut has a more spreading habit of growth than the red one; is more prolific, and is slower in coming to maturity.

The red is earlier and yields fewer imperfect pods or "pops"; the colour of the thin skin which envelopes the kernel differentiates the two varieties.

The seeds are sown in deeply ploughed ground about 2ft. apart. It takes 30lbs. to 50lbs. of earth-nuts to plant an acre.

Weeds are kept down, and the surface prevented from setting hard; cultivation ceases when the flowering organs have penetrated the soil, and when the vines have spread sufficiently to keep down the weeds.

The crop should be harvested before the first frost. The plants are dug up by the aid of a close pronged fork, and the root portion with the pods adhering is exposed to the sun to dry. When wilted, the earth is shaken off the roots of the plants which are either loosely stacked, or the nuts are then picked off the vines, and screened and sorted for market.

An average yield is about 10cwt. to 12cwt. per acre, or 50 to 55 bushels, weighing 25lbs. to 30lbs., according to the plumpness of the kernel.

The dry vines constitute very good fodder for cattle, or if not fed off, are ploughed in for manure.

GATHERING AND MARKETING FRUIT.

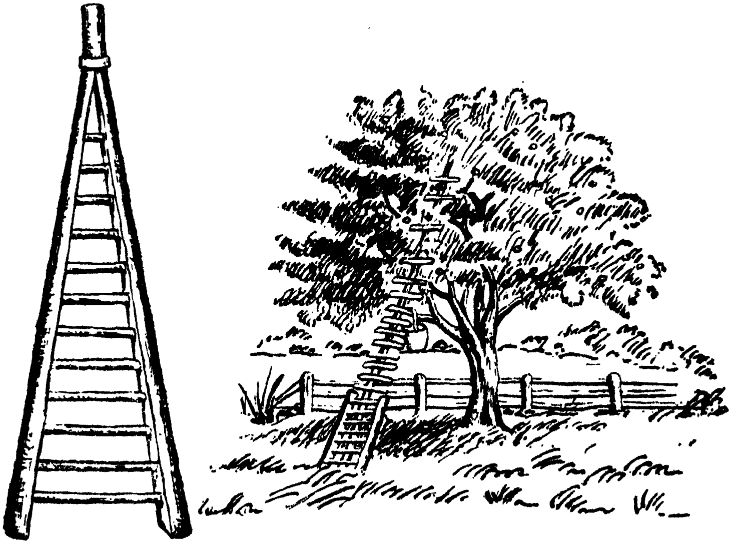
By A. Despeissis.

(Continued from page 305.)

Of other fruit, bananas, tomatoes, and persimmons are picked when just showing faint signs of approaching maturity, as they ripen during transit, and may with safety be held back until ready for use.

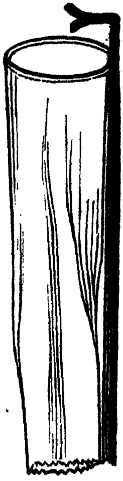
For the convenience of pickers, and for ensuring that fruit is gathered expeditiously and without bruises, a few ingenious orchard appliances are here illustrated.

A long and light orchard ladder is essential when prunning tall trees and gathering fruit. Such a ladder can readily be made of some fibrous kind of timber, such as stringy bark or oregon pine. The peaked top enables it to be run into the top of tall trees and rested against a branch. An ordinary hinged step ladder with a flat top, where baskets may be placed, is very useful.



Fruit Ladder.

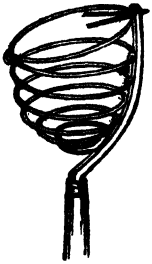
Some fruit often hangs at the top of long branches and out of the reach of the pickers. One common way of getting them down consists in dislodging them by means of a long pole. It generally happens that such fruit is knocked about and bruised beyond recognition. In order to reach these outlying fruits, various kinds of fruit-picking devices are used, two of which are here illustrated.



V. Picker with delivery sack.

This picker consists of a long pole armed at the end with a V-shaped hook, which pulls the fruit from the stalk; a canvas hose stretched round a hoop fastened underneath the picker conveys the fruit to the hand, one fruit only being allowed to come down the bag at a time.

The second design is another ingenious one, which any tinsmith can make. It should, for the sake of lightness, be made of tin-wire. In that case, the fruit is delivered to the picker by taking down the instrument.



Wire Picker.

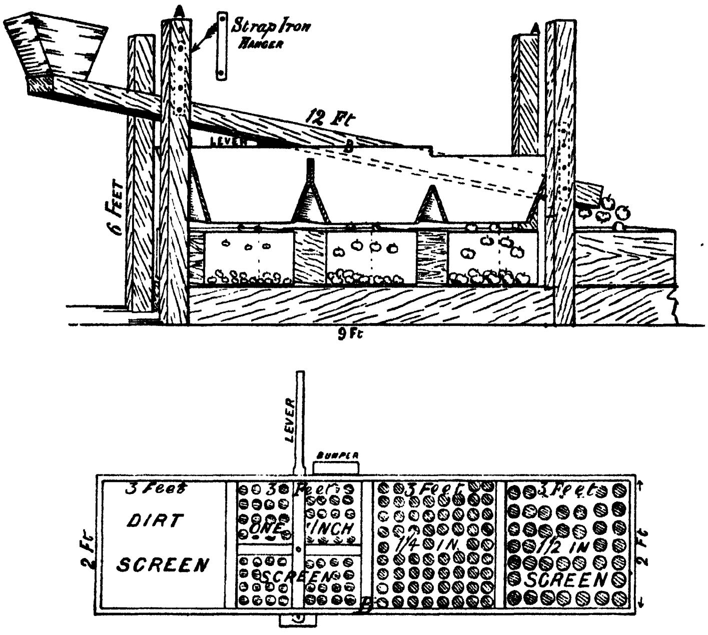
Grading.

It may be said that the farther the orchard is away from market, the greater the need of bestowing on picking and packing fruits the attention it deserves. The wants of the local markets are in a manner understood and complied with by most growers; but commercial fruit-growing, which generally means shipping to long distances and necessitate numerous and at times rough handling, must be known and studied.

However carefully the fruit has been picked, it is essential, in order to secure top market price, to grade it. This is best done by hand, as most mechanical graders advertised are only suitable for sorting out potatoes or second-class hard fruit, or for grading dried fruit.

A definition of what constitutes first-class fruit will prove instructive to growers. A perfect specimen is not necessarily first-class fruit. First-class fruit as understood in the market is a parcel of fruit of one variety, full grown, well-coloured, without blemish due to insect or fungoid blight, carefully picked, all of as near as possible one size, shape, degree of ripeness, got up in neat and appropriate packages, showing no shrinkage, and correctly labelled. Some growers sort out their fruit into three or even four grades, such as "extras" or "selected," "fancy," and "first-class" and "culls." In that case the term second-class or No. 2 is often substituted for the term "culls."

These names are preferred by some fruit dealers to the numerical descriptions representing the quality of fruit, as although No. 2 grade may, for all purposes, be almost as good as No. 1, yet many object to appear dealing in any commodity which is not first class. On the other hand, those fancy names described above do not convey any very clear and definite idea of the standard which directs their classification, and what appears "extra" or "fancy" to one dealer may not fill another dealer's ideal.



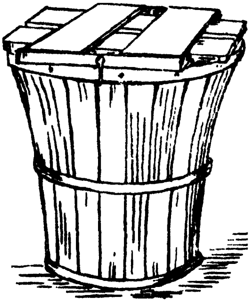
Home-made Fruit Grader.

Of fruit graders a number of types are found in the market, but they are all constructed on the same principle, and the above diagram illustrates an easily constructed home-made grader, which finds favour in California. A strong oblong frame is constructed of 4 x 4 timber about 9ft. apart, well braced, with the uprights set wide enough to allow the shoot to play between them. The shoot (B) is about 12ft. long by 2ft. wide, and is provided with as many screens as it is desired to have grades of fruit. These screens may be made of galvanised iron with holes of the desired size punched into them, and may be changed to suit the kind of fruit to be graded. First comes the dirt screen, 3ft. x 2ft., then, say, the screen of small fruit and culls, which is followed by a larger screen and a larger one again, while the largest fruit may, if so desired, be delivered into a box at the end of the shoot. The lower part under the shoot contains the bins with sloping bottom so that the fruit will slide easily.

The screens shown in the lower part of the illustration are for apricots and plums; larger holes would be required for larger fruits.

The shoot is hung on the uprights with iron straps about one foot long, in which holes are punched so that the pitch of the shoot may be changed. A rocking motion can thus be imparted to the shoot by means of a lever bolted to the under side of the frame. This lever when pulled and released strikes a bumper provided alongside, and gives to the rocking shoot a jar, which sends the fruit along.

As the fruit is picked it is consigned to some receptacle until it can be emptied into a case or taken to the packing shed. In order to obviate the necessity of continuously going down the steps or of stooping to let down the picked fruit, that vessel must be within easy reach. The following illustration is that of the New Jersey peach basket, which is in the shape of the inverted frustrum of a cone. It is made of wood splints and has a flat or a curved cover. These baskets are held at about one's waist by dropping them into a hoop which is held upon the person by a strap over the shoulder. The picker has thus the use of both hands. When filled it is left in the shade under the tree whence it is removed by a cart to the packing shed, when the contents are sorted, graded, and packed.



Peach Basket.

For most fruit an ordinary wicker basket with a handle is very convenient. Some line the basket with bagging to deaden the fall and avoid bruises.

Strawberries are best packed straight away into the small wooden punnets, and when thus filled they may be placed without further handling into strong crates.

PACKING.

Good fruit deserves good packing, and bad fruit will not sell without it. Every orchardist should be well imbued of that fact, and keep it well in mind. Anything that tends to give the buyer the idea that extra care has been used in the packing will pay.

It is admitted on all hands that apart from detracting from the look of the contents, and bringing for first-class fruit second-class prices, the pernicious practice of using soiled, stained, second-hand packages often prove to be the means of unconsciously distributing destructive orchard pests.

The idea that second-hand cases are cheaper than new sawn cases is, when all is considered, very questionable. They cost, it is true, to purchase less than new cases, but the extra cost of freight, of cartage, time, and material used in repairs outbalance the difference.

The lower price goods packed in second-hand cases invariably fetch whenever compared with the same grade goods packed in new cases is in itself sufficient to stamp this class of package as costly to the grower, who often, moreover, is given cause to repent having used them when new blights and pests carried as spores, eggs, or larvæ in the cracks and crevices of the timber, invade his garden.

Honesty in packing is a cardinal rule which should on no occasion be departed from, and especially on a glutted market is the grower made aware of it. The glaring fraud of topping inferior fruit and rubbish with picked specimens is, as a rule, so noticeable that it passes comprehension that some should still persist in it.

When packing it is permissible to double face the case, bottom and top. A layer of fruit is carefully set at the bottom; these, for the sake of uniformity, show the same side. Over these fruit of the same grade and type is used as a superstructure, and a top layer of even fruit also facing the same way is set, when the cover is gently pressed down and nailed. The case is then ready to be branded and despatched.

It very frequently happens that in order to test the packing the dealers open the cases sideways, or on the bottom end; and even often, when a large parcel comes under the hammer, one or two cases, picked out at random, are tipped on the table exposed to view, and stand as a sample of the whole lot.

For long-distance shipping, it stands to reason that nothing but first-class fruit will pay for freight, packing, for shrinkage due to natural causes, and other incidental changes.

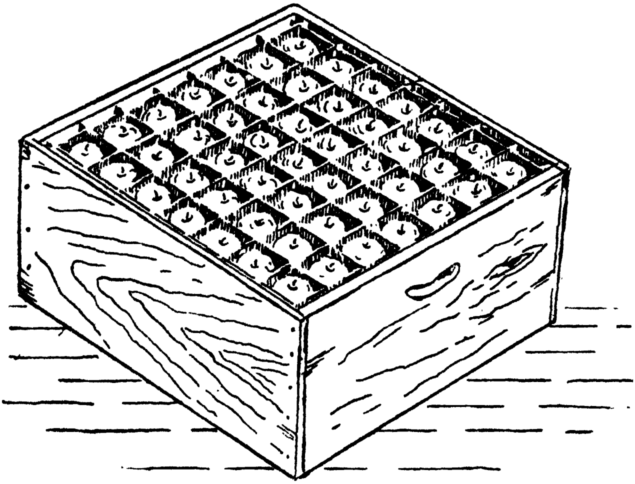
HOW TO PACK.

In connection with this important question, the experience of fruit-growers and of those engaged in the trade will be of value.

In America, where the art of packing has been brought up to a high standard, the bulk of the apple and pear exporting trade is done in kegs or barrels of standard size. These are double-faced, bottom and top. This facing is done by selecting fruit of uniform grade and placing them in concentric rows. About two tiers should be faced, the rings of one tier breaking joints with those of another. The stem end is turned towards the end of the barrel.

In filling, the barrel is lightly shaken every now and again to settle the fruit firmly. When filled, the apples should stand half an inch to an inch or so above the chine, and they are pressed down gently by the cover, which is then nailed securely. If the package is lined, and if the fruits are wrapped with paper, the spring of the paper itself will take up the slack and will keep the fruit in place.

For the fancy export trade, an improved if more costly system of packing has been used with striking success. It consists of a light but strongly-made box, into which fit tiers of light cardboard trays, with compartments somewhat similar to those found in egg cases. Each pear, apple, or peach is fitted into one compartment, where it is kept from contact with its neighbour; so that if one decays the adjoining fruit is not injuriously affected, as is the case with a mere tissue paper wrapping.



Fancy fruit box with compartments.

The cardboard trays may be made to hold from two to four dozen fruit, with two or three tiers in each box. This package is necessarily very costly, but for the safe carrying of choice fruit to distant markets it offers obvious advantages.

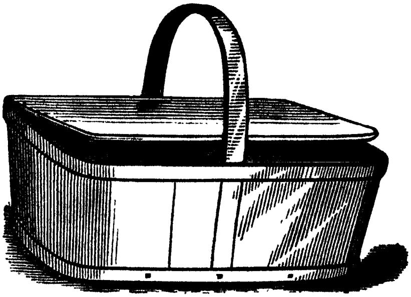
Regarding the packing of apples, the following methods adopted by some Victorian and Tasmanian growers convey their own lesson.

The long apples, such as Cleopatras and Pearmains, should be packed in the case with the eye downwards, so that the side of the fruit should show when the box is opened in the auction room, to exhibit its nature and quality. The round fruits, such as Nonpareil, should be packed with the eye towards the side of the box, so as to show its best aspect.

For wrapping, take a piece of paper cut to size. The sheets usually measuring 29in. x 19in., will cut from six to eight wrappers, according to the size of the apple; place it in the palm of the hand, place the apple to be wrapped with its eye in the centre of the paper, close the fingers slightly and twist the edges, enclosing the stalk of the apple in the twist. Place each wrapped fruit singly and firmly into the box. If there is a corner into which an ordinary apple will not go, do not jam a small apple in it, as this will spoil many fruit; fill it with paper shavings. When the case is full, put some paper shavings on top of the fruit, put the lid on, and press gently with the knee and nail down. A well packed case can be put on any of its sides without the fruit moving at all, although the apples are not tightly jammed.

The Tasmanians—who after years of trial, attended with alternate success and failure, have now firmly established a large and growing export of apples—exercise the utmost care in handling the cases. A few occasionally get somewhat jarred, but they are at once put aside and re-sorted, for one damaged case put up to auction at Covent Garden often affects the sale of a large parcel. It is not uncommon for one steamer to take on board ten to twelve thousand cases which, one and all, are most gently handled. The shippers have their representatives present to see that everything is properly done. The cases of apples are lowered from the stacks awaiting shipment on to trollies, then lifted on to the shoots, down which they smoothly slide into the hold of the vessel. There the men receive them (working under supervision), carefully stack them, and thus the whole operation of shipping goes on expeditiously and smoothly.

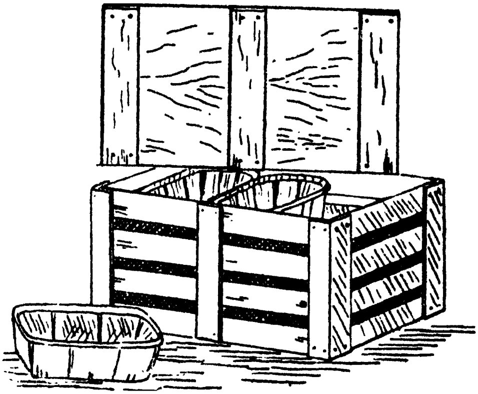
Peaches require even more delicate handling than do apples and pears. The style of packing of the Michigan and Georgia peach-growers is here illustrated.



Michigan Peach Basket.

This is much like the standard grape basket, the chief difference being in the cover, which is made of slats nailed to a curved rim at either end. This package varies somewhat in size, a favourite one holding a peck.

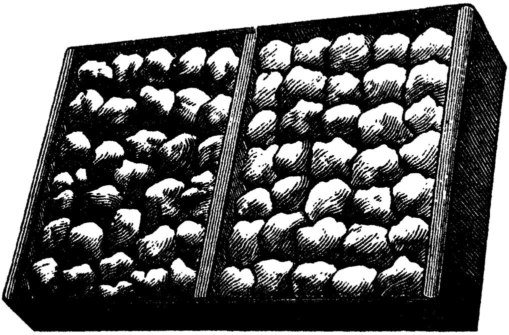
Another form of peach package is the six-basket crate. In shape it is much like the strawberry crate, and is made to hold two tiers of three small wood veneer punnets. These punnets hold about half a peck, so that the six-basket crate contains about three-fourths of a bushel of fruit. Between the two rows of punnets is a false partition made of thin board, to prevent the bruising of the fruit in the lower tier. Larger crates to hold either three tiers of punnets or two rows of four punnets each could also be made with advantage. This form of packing is particularly suited for select grades of fruit, and can also be utilised for packing choice plums,



Six-basket Crate.

apricots, persimmons, and early tomatoes. Unless the fruit is of the very best quality, it cannot present an attractive appearance, and this case at once becomes an unprofitable package, because all the imperfections of the fruit can be seen at a glance; instead of the buyer being pleased with its appearance, he is repulsed. For that reason, whenever a grade of fruit below "fancy" is marketed, any other suitable package than a "carrier crate" would be more profitable.

Apricots for marketing are carefully picked before they are thoroughly ripe, each fruit, if of special value, may be wrapped in tissue paper and symmetrically packed in a shallow box.



Box of Apricots.

Another illustration shows a safe way of packing choice apricots in a light wood veneer basket.

Basket of Apricots.

All soft fruit, including those mentioned, as well also as figs, should never be packed in more than two layers, and whenever the fruit is of a particularly soft kind one layer only is advisable.

Grapes do not all carry or keep well. Those with a firm skin and flesh are the most suitable for this purpose.

Amateur packers are apt to err in the direction of packing too loosely, they are afraid of setting them firmly for fear of spoiling the bloom, whereas they go the right way to work to lose the whole of it. If the bunches will not bear a rough shake they are sure to travel badly.

When packing grapes, several styles of boxes are used. Any of those figured on the plate illustrating the fruit cases more commonly used in Australia will do, and more particularly Nos. 1, 3, 4, and 5.

Their capacity is about a bushel, and they hold, according to the kind of grapes and the careful packing, from 28 to 36lbs. of fruit.

The bunches of grapes having been snipped off the vines with as little handling as possible, are carefully laid in baskets, and taken to the packing shed. It is preferable to pick them in clear, dry weather, and in the cool of the morning. When packing in the large cases, which are first lined with clean white paper, commence by packing the bunches firmly and neatly together stalks inside and point downwards. After packing a few layers, rock the case sharply to cause the grapes to settle firmly, and proceed in a like manner until the case is full. The last bunch or bunches should fit in extra tight, the top layer having been carefully laid on the surface, which should stand an inch or so above the side of the case. The lining paper is then folded on top, the lid laid flat, and pressure gently applied with the knee whilst the nails are being driven. Any small empty corner or hollow can be with advantage filled by means of a few berries snipped off by means of the secateurs.

Nothing in the shape of packing should be placed on the top or among the bunches for the local market.

For export, cork dust may be well sifted in between the berries, to prevent their touching. The cork dust should be coarse, as if too fine it spoils the appearance of the berries, and works out of the case.

The grapes should not be over-ripe or sunburnt, but may be exposed to the air for a little time to allow of the skin being toughened a little before packing.

After the bunches have been spread out for a few hours, each bunch is gone over, and any faulty berries are removed with a pair of scissors.

Of the tough varieties, the berries of which adhere firmly to the stalk, only the more open bunches are fit to pack for distant markets.

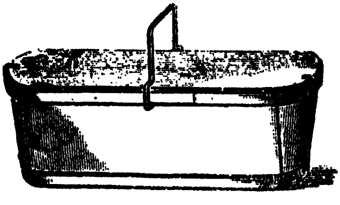
The amount of cork dust required for packing grapes (a bushel case) varies from 4lbs. to 6lbs., costing 1s. to 1s. 6d. Begin with 6lbs., and with practice reduce to 4lbs.

Some of the tougher grapes, such as Almeria, Flame Tokay, Emperor, when properly packed in granulated cork, will carry without cool storage to distances of 12 to 14 days' travel from the port of shipment, and open out in excellent condition.

With good carrying varieties of grapes, suitably packed, an important trade with India, only nine to ten days from our shores, lies within our reach.

From South Australia, Almeria (White Daria) grapes have for several years been shipped to England, packed with cork dust or jarrah shavings, both materials proving equally suitable for the purpose.

For some time past, in America, the grape basket has been introduced with marked favour. In shape it is similar to the Michigan peach basket, illustrated above, one marked improvement consisting in the substitution of a folding wire handle, instead of the stiff wooden one. This permits of a number of these baskets being packed in a crate. Two sizes are made, viz., five-pound and a ten-pound basket. The ten-pound baskets usually hold only a trifle over eight pounds of fruit, and the five-pound baskets a little over four pounds. But as this is commonly understood, and the grapes are sold by the basket and not by the pound, no one is greatly deceived.



The Grape Basket.

The basket is made of thin wood veneer, with a light wood binding at top and bottom. The light wooden cover is fastened on with a special clasp. Strawberries and other berries until of late years were amongst the most difficult of our garden fruit to market. Since then a fresh spurt has been given to their culture owing to more perfect methods of picking and packing.

A few cardinal points must be observed in order to obtain full value in the open market. The picking must be done with neatness, thoroughness, and honesty. The berries should hardly be touched with the hands, but the stalk nipped off between the finger and nail.

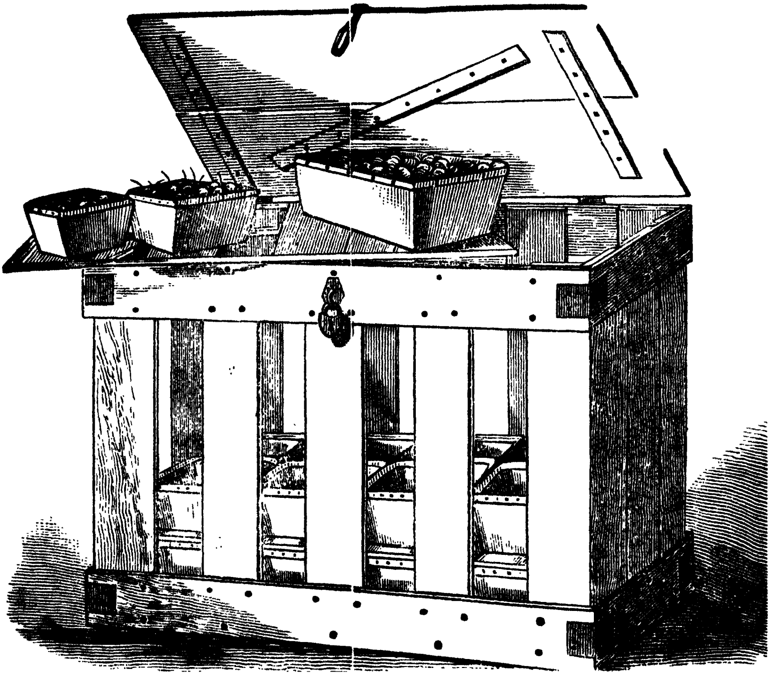
As the berries are picked they are carefully dropped into small wooden punnets holding either one pint or one quart; these punnets should not be filled too high, and it is permissible to place on top some attractive berries. As the picking proceeds the fruit is graded—early in the season into two grades, and later on, when the full season comes, all inferior and damaged berries should go to the jam cask. The packing, however, should be honestly done and all damaged, inferior, or unripe berries excluded from the packages of first-class fruit. At this stage it should be the growers' business to closely supervise the work of the pickers and promptly weed out any showing careless, slovenly habits.

The punnets as well as the crates should not be left exposed to the hot sun or the wind; they are not lined with fancy paper or packing of any sort, although a few leaves will add to the appearance of the fruit. As these punnets are filled they are placed in layers in crates; when one layer is ready, a piece of cardboard or some thin boards are placed over it, and another layer of punnets set, and so on until the crate is filled, when the lid is fastened down and the package is ready for conveying to considerable distances, care being taken not to turn the crates upside down. The Sydney and the Melbourne markets are in this way supplied, early in the season, with Queensland strawberries. For long keeping and for distant markets the berries should be picked before they are overripe, and of course, the firm-fleshed varieties are for that purpose more suitable than the more tender ones.

Foremost amongst these in the estimation of our growers is the *Paxton*, with the *Edith* following, whilst the *Marguerite* and the *Noble* however desirable in many other respects, often reach market with a notable proportion of the berries bruised and crushed.

The crates used by our strawberry growers hold 40lbs. to 50lbs. of strawberries. It is essential that they should be well ventilated.

They are also branded with the grower's name, and such brand should be a guarantee of uniformity of the contents.

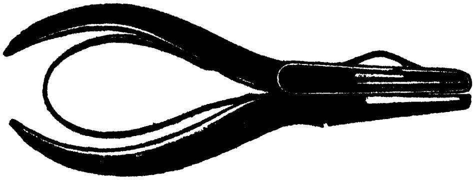


Punnets and Crates for packing soft berries.

For those who have only a few pounds of strawberries ready for market, an ordinary half case with the centre board removed affords a very useful packing case; two rows of five punnets each can be packed into these cases.

Oranges and lemons must undergo a preliminary process of curing before they are packed and shipped to distant markets.

Whenever possible, citrus fruits should be picked in dry weather, but this is not always practicable with us when they chiefly ripen during the rainy winter months; should they be wet, they must be dried before packing.



Lemon clipper.

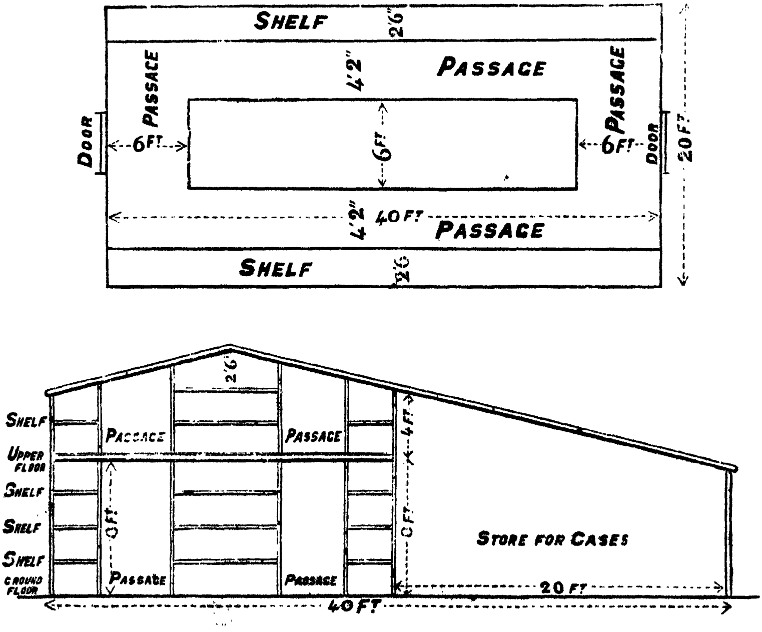
When *picking* for long storing, only those fruit free from blemishes should be chosen; any thorn prick or scaly fruit will have a very poor chance of keeping. Some pickers are even so careful that they keep their nails well trimmed. Each fruit is individually clipped off the branch by means of specially constructed lemon clippers with blunt blade tips and a spring like those on secateurs; a knife at times grazes the fruit and causes it to rot.

The fruit, when picked, is placed either in baskets or a waist sack, and carefully transferred to the sweat boxes.

A fresh orange or lemon has a rind easily bruised, the oil cells are then rigid and distended, and the slightest bruise or scratch ruptures them.

The sorting having been done—usually in the orchard—the fruit is placed in the *sweat boxes*, and left in the packing-house until the rind slightly wilts and the surplus oils and moisture have evaporated, making the peel tough and flexible. This takes two or three days, or, in moist weather, even a week, after which the fruit can be pressed into the boxes when it will not very perceptibly shrink.

The droplets of moisture found after a cool night on oranges stacked in a heap are not due to "sweat," but to condensed vapour. This moisture, which interferes with wrapping and packing, does not condense in well ventilated storing houses.



Fruit Storage House.

The above diagrams show the ground plan and elevation of a well devised *storing house* for keeping lemons over an extensive period. The essential conditions of such a house are exclusion of light, regulation of temperature, good ventilation under control, convenience of handling. Provided these requirements are borne in mind, much less pretentious storing houses, readily constructed out of material on the ground, may be made to answer the same purpose. Any roomy shed, built with pug or pisé walls, about one foot thick, with ventilators at the top of the walls, will prove cheap and convenient. The ceiling can be made of split logs with a layer of pug on top, whilst an iron roof, with projections to save the walls, would efficaciously keep out the weather. In order to keep such a house cool, the doors could either be left open at night and closed during the day, or a tunnel might be dug a couple of feet or so under the ground, leading into the storehouse. Such a tunnel, with a cowl or windsail on the outside end, would create a cool draught which could be regulated at will inside the structure.

The sweat boxes should be kept off the floors so as to insure the circulation of air around them. They are also better placed in tiers over the shelves with ample room above for the occasional examination of the fruit.

If the oranges or lemons have not been *graded* in the orchard they are, when fit to pack, sorted into two grades, the "brights" and the "russets," whilst all imperfect and damaged fruit is thrown out. The brights are those smooth-skinned fruits without a blemish. They are further graded into "fancy" and "brights," according to size and appearance.

The russets may also be graded into two classes, the lighter being called "golden russets." The "drops," "culls," and scaly fruit are never shipped and are sold locally.

All fruit, after grading, are *sized*. For this purpose special sizers are constructed, which are suitable where large quantities are handled, this operation secures uniform packing.

When this period is reached, the fruit is *wrapped* in soft, tough paper, as has already been described in speaking of the methods of packing apples and pears for export. The final twist given to the wrapper is done round the stem and affords a protection against puncturing the fruit packed next in the case. Japanese ricepaper or waxed paper cut in sizes 10 x 10 inches or 10 x 12 inches are the best for wrapping fruit.

Newspapers and printed papers should be tabooed for either lining the case or wrapping the fruit, as the printer's ink is readily absorbed by the fruit and spoils its flavour.

When *packing*, only fruits of one size are used for each case. These are firmly set, but not so tight as to crush the fruit out of shape. If a gap shows, it should be filled with white paper shavings and no small fruit should be wedged in, as this will often spoil the sale of the case.

Brand every case distinctly and neatly. The brand should indicate the nature and, if possible, the number of the fruit and the quality. In addition to this brand it is customary to have on the case the brand of the shipper or of the grower. Such a brand should be attractive as well as distinct and conspicuous, which will prove a great convenience when shipping and handling stacks of cases.

Lemons cured and handled as explained can with profit be stored until such time as a brisker market will absorb them at an enhanced price.

Thus, lemons which would sell when the market is glutted for, say, 3s. a case, as happens when the bulk of the crop comes in in May or June, may be kept until the return of the warm weather in September and October, when the demand for them is more active and when the market is bare of the imported Sicilians, which only arrive in November. At that season good lemons are scarce, and sell for 10s. to 12s. a case and even more. The profit which the grower is susceptible of getting by curing and keeping his good lemons may be estimated thus: From the time of keeping in April and May until September or October, there is a natural shrinkage of the fruit, which amounts to about one-third of the bulk: three cases, as cut, produce two cases cured. In other words, three cases at 3s. equal two cases at 4s. 6d. To this must be added a certain percentage of loss during curing and long keeping, which averages less than 10 per cent., or say 6d. per case, bringing up to 5s., in September and October, the price of lemons which, in May and June, would have sold for 3s., and thus showing a surplus profit of 5s. to 7s. per case for the extra care in cutting, curing, and storing.

THE BLACKWOOD NURSERIES.

Rapid progress has of late years been made in Western Australia in vine and fruit growing.

From 1893 to 1903 the acreage under vineyards and orchards has increased from 3,000 acres, or thereabouts, to over 10,000 acres, while this winter's planting gives every indication to be particularly heavy.

The bold and liberal land settlement policy of the Government has opened up vast areas of land where clearing, fencing, and cultivation are progressing at fever heat, and the country is being dotted with homesteads where gum trees stood only a few months ago. Every new settler's first care is to have some fruit trees around his new home, while those who have been on the land sometime already

Mr. J. Hawter's Nursery at Bridgetown.

realise how particularly adapted for fruit growing this State is, and a great many of them add annually to their stock of fruit trees and vines.

For several years past our leading local nurseries were unable to supply in full the demand which existed for fruit trees, and the older established Eastern States nurseries did a thriving business, in spite of the marked disadvantage they laboured under as regards distance, sea freight, inspection, and fumigation at the ports of entry, and not uncommonly seizure and destruction of blighted trees.

Local enterprise during that period was not, however, at a standstill, and our Western Australian nurseries kept on extending their beds and adding to their stock of trees and vines, until now the leading establishments amongst them may be said to compare favourably with the most noted nurseries in Australasia. Indeed, several new and valuable varieties of trees, introduced at great cost from the United States and Europe, and quite new to Australia, stand advertised in their catalogues as evidence of enterprise and concern for the requirements of their customers.

In the present issue we give an illustration of an extensive view of the Blackwood nurseries and orchards.

The owner, Mr. J. Hawter, who for a number of years previously had built up an ever-increasing business at the Darling Nurseries, Smith's Mill, started operations at Mullalyup, on the Bunbury to Bridgetown railway, about three years ago. The Smith's Mill site proving too circumscribed, Mr. Hawter's first care was to secure at Mullalyup a few hundred acres of the pick of the Brookland's estate, in close proximity to the railway station; and as he cleared, dug, and prepared land, truckload after truckload of nursery trees were transferred from Smith's Mill to the Blackwood, there carefully fumigated in chambers built for that purpose, and placed in nursery beds.

Whilst in nursery rows, which are all carefully labelled and entered on the nursery books, the plants receive constant attention, regarding proper shaping and training, and the spray pump is on the scene whenever the slightest appearance of pests or blights are detected.

Particular attention is given to the matter of suitable stock for the several varieties cultivated, and only buds from trees true to name and of healthy growth are taken for propagation.

This, together with the well-known Woodbridge Nurseries, at Guildford, share in the bulk of the trade in supplying the requirements of orchardists, floral gardeners, and others.

NOTES ON CULTIVATION OF WHEAT.

By Percy G. Wicken.

(Continued from page 302.)

The following varieties will be found most suitable for the different districts:—

For the Eastern Districts: Steinwedel, Hudson's Purple Straw, Steers' Purple Straw, Farmers' Friend, Australian Talavera.

For the Southern Districts: White Essex, White Hogan, White Lammas, Tardent's Blue, Australian Talavera.

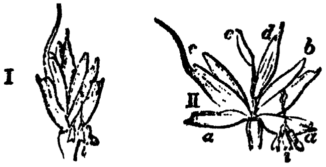
For the Midland Districts: Blount's Landbrigg, Australian Talavera, Improved Fife, White Lammas, Tardent's Blue.

For the South-West and Coastal Districts: The Macaroni wheats, Mediah, Belatourka, Algerian, with Steinwedel and Allora Spring for flour varieties.

The accompanying short description of some of the varieties mentioned, and for which we are indebted to the New South Wales *Agricultural Gazette*, may be of use to settlers to assist them to know whether their wheat is true to name.

As some of the terms used may not be too familiar to our readers, the following explanations and illustrations may be of assistance to them:—

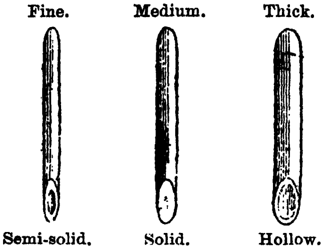
In speaking of an ear of wheat, when we say it is bald we mean it is not bearded; when we say smooth, we mean not velvety; when we say regular, we mean having its parts arranged in an orderly manner; when we say square, we mean that when the ear is looked at end-wise its two diameters appear of equal length; otherwise, it is flattened, and we say obversely flattened when the long diameter, or width, is in the direction in which the spikelets



(I.) The spikelets of an ear of wheat.

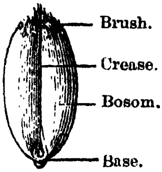
(II.) The same spikelet opened to show the parts; *a*, the outer chaff or glumes; *b*, *c*, two pairs of the inner chaff or palets (both *b* and *c* enclose a grain when ripe); *d*, *e*, two further pairs of the inner chaff which often fail to grow grain; *i*, the three stamens issuing from *b*. The spikelet was drawn at time of flowering.

are spread out; when we say glaucous, we mean having a bloom like that on grapes and plums; when we say mucronate, we mean having a spur or prod at the tip.

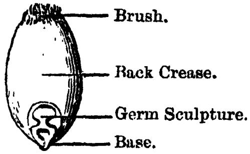


Three pieces of wheaten straw, natural size, to show what is meant by the terms—semi-solid, solid, and hollow, and fine, medium, thick.

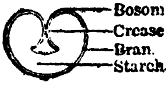
We speak of the crease of the grain as deep when it cuts two-thirds of the way through, and shallow when it passes only half-way through.



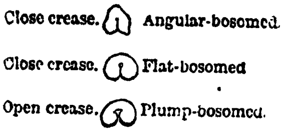
A grain of wheat, front view, three times natural size, to show the different parts.



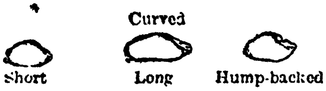
A grain of wheat, back view, three times natural size, to show the different parts.



Section through a grain of wheat three times enlarged, to show the different parts.

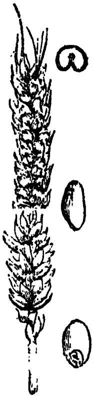


Section through three grains of wheat to show what is meant by the terms: angular-bosomed, flat-bosomed, plump-bosomed, close crease, and open crease.



Three side views of grains of wheat to show what is meant by a long, short, a curved, or hump-backed grain.

Steinwedel.—This is one of the early and prolific, but delicate and rust liable, bald, purple straw varieties, and one that stools abundantly. It originated in South Australia. Its chief fault is liability to shell, and so great is this that unless the grower can put his machine into the crop at will on any given date, when the Steinwedel is ready, and go through his harvesting at good speed, he is sure to suffer much loss. Shortly after the grain commences to harden, the chaff begins to break and the grain to fall out, and a few dry days is sufficient to allow a large percentage of loss, especially if winds prevail to knock the ears about. The stools are large and about medium height. The strong and stiff, though hollow, straw is of medium thickness, furrowed, slightly brittle, tapers little, and is of a dull purplish colour. The flags are large and drooping, and of a light green colour, and decidedly weak. The ears are prolific; they are rosy, smooth—*i.e.*, not velvety—large, long, regular, compact, of medium size, flattened obversely. The chaff is of medium size, soft, and rather thin, with short awns below and long ones towards the tip of the ear; shallow, round-backed, dull and uniform in colour; though crowded close upon the grain, loosely attached. The grains are large to medium in size, medium length, straight, of medium plumpness, opaque, yellowish, somewhat flat-bosomed, or even angular-bosomed, blunt at both ends, with a fairly large brush, a deep open crease, a large germ sculpture. A back crease is often visible, and the section of the grain is mealy.



Steinwedel.

Hudson's Purple Straw.—This is a tall, beardless, free-stooling wheat, with a strong stiff straw of medium thickness. When ripening, the straw becomes first purple and finally yellowish. The ripe straw is dull coloured, and although quite hollow, is tough. The foliage is abundant, long and drooping, of a medium green colour, and never very glaucous. The numerous large, long, and regular ears are erect and rather compact, especially at the tip, where they are slightly clubbed and end abruptly; they are almost equally abrupt at the base, there being seldom more than two sterile spikelets at the bottom.

The fertile spikelets are spreading, and contain three or four large, long, yellowish grains of medium plumpness. The chaff is nowhere very blunt, and towards the tip of the ear is armed with awns, the very topmost spikelet bearing awns of a considerable length. In colour the chaff is uniform and dull; it is smooth—*i.e.*, not velvety—deep and round-backed, and is firmly attached and lies very close upon the grain, thus giving this variety the property of holding the grain very well and so allowing the use of any sort of harvesting machinery without much loss. The grain threshes out easily, and will fetch the highest price, being of a first-class milling quality. It is opaque, of a yellowish colour, plump-bosomed, blunt at both ends, and has a deep crease. When cut with a knife the inside of the grain shows mealy, and the bran appears thin, and this demonstrates one of the few deficiencies of this wheat, namely, starchiness. The flour will be beautiful and white, but deficient in gluten. The germ sculpture is small, occupying only one-fourth of the length of the grain; a faint back crease is often visible. Hudson Purple Straw is a very prolific wheat, and is beyond question one of the very best of the purple straw sorts.

Steers' Purple Straw.—The good and bad qualities common to the purple straw wheats are exemplified in this variety, which, however, has, as an offsetting merit, its unusual earliness. It stools very well, and is a rather tall sort, with a strong, tough, stiff, rather hollow straw of a medium thickness, which tapers but little, and which, though yellowish when ripe, is purple previously; the abundant foliage is characterised by a large, wide, rather light green drooping flag. The heads are typical purple straw heads—*i.e.*, are rosy, bald, long and large, regular, compact, of uniform size, or slightly clubbed at the tip only, square, erect, straight, acute at the tip, but rather abrupt at the base, where there are only one or two sterile spikelets. Though the fertile spikelets spread but little, they contain three large grains at least. The chaff is about medium length, mucronate but blunt, presents a few long awns at the tip of the ear, is stiff, streaked with colour, but dull, deep, round-backed, firmly attached, and hugs the grain closely, so that shelling is prevented. When the grain is said to be large, long, straight, of medium plumpness, opaque, yellowish, rather flat-bosomed, blunt at the tip, rather blunt at the base, with a medium-size brush, and a close deep crease, it will be seen that its good qualities do not fall behind those of other purple straws, which are all notably good and suitable for milling. The back crease is rarely visible; the germ sculpture is comparatively small. The interior of the grain is mealy, gives a beautiful flour, but with a high percentage of starch, and therefore less nutritous than those with a higher proportion of gluten.

Farmers' Friend.—This is a most prolific sort when it comes to perfection. It is above the medium height, and the straw is dull in lustre, yellow or purplish, thick, furrowed, hollow, stiff and strong. The foliage is abundant and drooping, the flags being long, broad, of a light or medium green colour and not glaucous. The long, smooth, rosy, straight, stout, erect, regular ears are bald, compact, club at the tip, square, sometimes a little twisted, blunt at the tip, abrupt at the base, where there is seldom more than one sterile spikelet. The spikelets spread much and contain three or four grains. The chaff is dull in lustre, uniform in colour, long, rather acute, mucronate, short awn towards the tip, long-awned at the tip, rather soft, deep and large, round-backed, firmly attached, and pressed firmly against the grain. Shelling does not occur. The grain is large, or medium size, a medium length, straight, of medium plumpness, opaque, yellowish, flat-bosomed, blunt at both ends, and has an abundant brush, a deep crease, and a mealy inside. A back crease is rarely visible. The germ sculpture is one-third as long as the grain. Farmers' Friend builds a strong dense stool, and is one of the most prolific varieties. It is a delicate mid-season wheat, and does well under favourable conditions.

Australian Talavera is of medium height. The dull yellow furrowed straw is of medium thickness, almost semi-solid, stiff, strong, and tapered little; at no period of growth is it purple.

The ears are smooth, whitish, bald, long, regular, very open, markedly tapering, square, erect, or leaning a little, nearly straight, acute at the tip, tapering at the base, where there are one or two sterile spikelets. The fertile spikelets are narrow, two-grained; the chaff is dull and uniform in colour, long, blunt, mucronate near the base of the ear, acute at the middle of the ear, and short-awned towards the top of the ear, very thick and stiff, deep, angular-backed, close lying, but loosely attached, so that a little shelling is likely to occur. The grain is large, long, straight, of medium plumpness, opaque, yellowish, flat-bosomed, or almost angular-bosomed, blunt at the tip, rather pointed at the base, and has an abundant brush, moderately deep crease, and often a faint back crease. The interior of the grain is rather horny. The germ sculpture is one-third as long as the grain. It is a hardy mid-season wheat, which stools well and yields well, and is somewhat resistant to rust. It is prolific, and its grain is of exceptionally good quality.

White Essex.—Rather tall, with good stools; straw strong, of medium thickness, stiff, fairly tough, hollow, tapering but little, dull in colour, distinctly furrowed, yellow, at no time purple. The heads are whitish, bald—*i.e.*, not bearded—long, regular, open, tapering, square, erect, nearly straight, acute at the tip, tapering at the base, where there are two or three sterile spikelets. The narrow spikelets contain only two grains, but, as usual where this is the case, both are large. The chaff is of medium length, blunt near the base of the ear, acute towards the tip of the ear, and even short-awned at the end; it is very stiff, almost shiny, sub-angular-backed, shallow, nearly uniform in colour, is firmly attached, and hugs the grain closely. The grain is large, long, straight, of medium plumpness, horny, yellowish, rather flat-bosomed, blunt at the tip, rather blunt at the base, and has a fairly deep crease and small brush. The germ sculpture is two-fifths as long as the grain, and is more dorsal than usual. The interior of the grain is horny. No back crease is visible.

(To be continued.)

DISEASES OF POULTRY.

By F. H. Robertson.

Poultry, like all live stock, are liable to be affected with sickness or disease, especially if not kept in accordance with "Nature's Laws." It is, therefore, necessary that all poultry-keepers should have some knowledge of the ailments of fowls and how to treat them. Not that I am in favour of wholesale doctoring—far from it; rather should the poultry man or woman use every endeavour to keep the fowls in good health by paying strict attention to their many little requirements. At the same time it frequently happens that the spreading of some contagious disease is stamped out by the speedy withdrawal of the bird affected before it has had time to contaminate the rest of the flock. In such cases it is generally advisable to destroy the sick fowl. In any case, it is absolutely necessary to be always on the alert for the slightest appearance of sickness. Do not delay, but at once catch the ailing one, ascertain what is wrong, apply the proper remedies, and keep the invalid in the hospital, with which every yard should be provided. This sick pen should, if possible, be right away from the regular fowl runs; and as fowls, even when in good health, chafe under close confinement, it does not do to keep sick ones entirely closed up in a box or basket, so a small run must be provided to allow the birds to move about in when the weather is fine. An enclosure of, say, 12ft. square is sufficient, situated in a sheltered locality quite away from the ordinary runs; let the sides be covered in all round to a height of about 2½ft., and to complete the isolation it should be wired in overhead, to prevent healthy fowls gaining access; also to keep the inmates of the hospital in their own pen. A small water-tight house, provided with a perch in the pen, which is wired in front so that the sick birds can be kept indoors if the weather is cold or wet. This system is the simplest mode of coping with sick fowls, as, owing to the smallness of the run, they are easily caught, and a dozen fowls can be quickly handled and doctored in a few minutes.

Apoplexy is not at all uncommon in this State, but it is very sudden in its attacks. The fowl is generally dead before treatment can be administered. Hens found dead on the nest is frequently due to this disease, owing to excessive straining or intense heat. Highly-fed and over-fat fowls, if subjected to undue excitement from chasing or fighting, are liable to go off suddenly. If a fowl is noticed staggering about and going round in a circle, letting cold water run from the tap on to the bird's head will generally bring it round; failing that, try bleeding by cutting the large vein under the wing.

Bronchitis.—Fowls affected with this complaint give a short, dry cough, generally noticeable at night, when on the perch. If unaccompanied by any other symptoms such as swollen eyes, discharge from the nostrils, or growths in the mouth, it is simply a form of cold, which is generally cured in two or three days by keeping the fowl in a warm coop, fed on soft food only, and add a few drops of aconite to the drinking water. This complaint must not be confounded with roup, which is described later on.

Bumble Foot.—This starts with a corn on the sole of the foot, caused by hard or stony fowl runs, or by birds having to jump from high perches on to a hard floor. If noticed when only the thickness of the skin, it can be cured by paring and removing bird to a soft or sandy run. But if neglected for some time the corn increases, eventually going right through the foot and swelling up considerably on the upper part of the foot, causing great pain and impediment in moving about, besides being very unsightly. When it has reached this stage it is very difficult to cure; but it is cruel to allow a fowl to go hobbling about with this distressing complaint. Great relief may be given by penning the bird up in a coop thickly covered with straw and poulticing the foot until the parts become quite soft, when the yellow, cheesy matter can be squeezed out; but as this is tedious work, it is much better to take the small blade of a sharp penknife, insert it right through the bad part and cut outwards, completely severing the webb in two; it will bleed freely, but if the operation is done under a running water-tap blood will soon cease to flow. All the yellow secretions can then be removed, and when all are taken away thoroughly wash out with strong phenyle and water, apply crude phenyle to the wounds, and carefully bind up the foot with linen bands, tying each one separately, so that the fowl cannot peck them off; the bird then should only be allowed to run on sand or straw until the wound is healed.

Chicken Pox.—This complaint is very common in this State; chickens and young birds under 12 months old are very subject to it, old ones being seldom affected. It comes in the form of warts on the comb, face, and wattles. Fortunately this nasty complaint is very easily cured; an unfailing remedy is to paint the warts with crude phenyle, one or two applications being sufficient.

Cholera is another frequent complaint in this warm climate; sometimes only individual birds are affected, and at other times large numbers. The symptoms are dullness of eye, ruffled plumage, staggering gait, general weakness, intense thirst, complete loss of appetite, droppings of a slimy greenish colour at first, then turning white or creamy. This disease comes on suddenly, and frequently kills off birds very quickly. The first intimation of its presence is the finding of several dead fowls, and others lying about in a helpless condition. All affected fowls should be immediately caught and kept in a warm coop. An effective remedy is chlorodyne; pour a few drops on a dry crumb of bread, and give every three or four hours; give little or no water; but as fowls are generally very weak and will not feed, it is necessary to keep up their strength, and for this purpose nothing is better than beaten-up egg, which can be administered by means of a teaspoon or small syringe. Sunburnt or dirty water, putrid meat, want of shade, and filthy surroundings are the chief causes of this disease.

Cold or Catarrh.—This complaint is one of the commonest, and is very frequent among young stock; although not serious if taken early, it is a great nuisance, and retards growth. Late-hatched chickens are more subject to it than the early and more hardy stock. It generally goes through the majority of the young birds, and is very catching, but if the first bird affected can be spotted and killed at once the complaint is nipped in the bud. The symptoms are a slight watery discharge from the nostrils, which if neglected becomes thicker, and in course of time develops into roup; the eyes are often inclined to be watery and puffy.

All affected birds should be removed to the hospital pen, and there fed chiefly on good nourishing soft food, but little grain, and plenty of greenstuff; add to the drinking water aconite, sulphate of iron, or any of the well-known advertised poultry tonics. Each bird should be handled daily, and the nostrils washed out with some antiseptic, such as permanganate of potash (Condy's Chrystals) or phenyle and water, always taking care to thoroughly dry off all moisture. Under this treatment birds improve rapidly, but with some it is impossible to quickly get rid of the affection; a thin, watery fluid continues to exude from the nostrils. Such birds, if they eat well and are of good constitution, may be turned out of the sick pen after about 10 days' treatment, and it will generally be found that they shake off the complaint in a few weeks, especially if the weather is in their favour. The birds that get worse and develop roup, if not valuable, might as well be killed off.

Canker.—There are two forms of this complaint; the first is on the comb. The large-combed varieties such as Leghorns, Minorcas, and Andalusians are most subject to it, especially the cocks. Hens pecking at the comb cause a sore, which frequently turns into canker; it starts with a small yellow scab, which soon spreads and eats into the comb, leaving a hole and causing the comb to hang over. The other form of canker is a yellow growth round and sometimes down the windpipe. To get rid of this disease, when in the throat, remove the growth with a pointed stick or pair of tweezers, and paint with the following mixture:—

1 drachm carbolic acid
3 drachms sulphurous acid
½oz. tincture perchloride of iron
½oz. glycerine.

Chlorinated soda is also a good remedy, especially when the comb is affected.

Crop Bound is due to a hungry fowl being allowed to indulge too freely on hard grain. It is generally easily cured by pouring small quantities of warm water down the bird's throat, at the same time work with the hand the moisture among the grain. Affected birds should, of course, be couped up and given no feed until the crop has emptied itself. Should the crop fail to empty by this means, an operation is necessary, by cutting the crop open at the upper end and removing every particle of food. A surgeon's needle is required for this work, but the necessary curve can be got on any ordinary needle by heating red hot, and then bending as wanted.

Crop Soft.—In this case the crop is swollen up, but is soft to the touch. To empty it, hold the bird by the legs and squeeze out as much of the liquid as possible, but care must be taken not to hold the bird long in this condition, owing to liability of choking. Then place a small quantity of effervescent powder, such as Eno's Fruit Salt, in the bird's mouth and immediately wash it down with warm water; give doses until the crop is fairly full; coop the fowl up for a day or so without feed or drinking water, and a cure will be very soon effected. But do not let the bird have immediate access to feed or water in large quantities.

Egg Bound.—This complaint, generally caused by the bird being too fat, is noticeable by a fullness and constant visiting of the nest in attempts to pass an egg. A good deal of trouble and patience is required in treatment, also great care must be exercised to prevent the breakage of the egg whilst being passed out. The usual treatment is to soften the posterior portions of the fowl by holding it over boiling hot water, and thus thoroughly steaming for a quarter of an hour at a time; also inject salad oil into the vent.

Egg Eating.—Many fowl-yards are troubled with this vice, and some birds are very determined and hard to break off the habit; but it will be found that a mixture of kerosene and mustard made up in an empty egg-shell, and kept continually before the offenders for a few days, will soon cause them to cease breaking good eggs for the purpose of eating their contents.

Feather Eating.—This is a vice prevalent among poultry kept in small runs, over-fed, generally badly kept, and in want of exercise. Lice on the plumage generally starts the habit. Fowls picking at the vermin, a feather or two are drawn out, and thus the taste is acquired. As a remedy, dig over the whole of the run, dust each bird with insect powder, particularly around the vent, at the same time pluck out all lice nits which are found, principally round the vent, damp the plumage with some unpleasant mixture such as Jeye's Fluid, feed rather sparingly, chiefly on grain, which should be partially buried to give scratching exercise. To the soft food add sulphur and salt; give plenty of green stuff; cabbages hung up give good jumping exercise. Moulting cocks in well-kept yards are sometimes attacked by hens, the new tail feathers being the attraction. In this case at once remove the cock to a pen by himself until the feathers are well grown. Frequently the hens turn their attention to the cock's comb, which they pick, making a large, raw sore. This sometimes happens in the breeding season, when the cock cannot be taken out of the pen. The best plan is to every day smear the comb with carbolated vaseline.

Leg Weakness.—This is not a disease, but a complaint, principally confined to cockerels of the long-legged breeds, such as Langshans, the weight of their bodies being too much for their long shanks. Prevention is decidedly better than cure, therefore if breeders of lanky chickens would always mix a little dry bone-meal in the soft food there would be but little leg weakness. It is often the biggest "youngster" in the flock that gets badly infected with the tired feeling, and has to squat on his hocks to feed. If he is not valuable, use him for the table; but if a good pure-bred bird, keep him in a roomy coop or small pen, well covered with sand or straw; give good, sound, nourishing food, plenty of greenstuff, bone dust, and tonic in the drinking water.

Roup is the greatest scourge of the poultry yard in this State, and the want of knowledge how to treat it has led to the loss of large numbers of poultry, and been the means of damping the ardour of many poultry breeders. At the offset, I might say, before going into details about the disease, that it is well worthy of a good deal of consideration being given to the best means of taking all precautions to prevent the disease breaking out. One of the chief causes is in allowing diseased fowls to come into contact with the healthy ones, either by association with the flock of a neighbour's birds or from stock purchased from a diseased yard. Contagion is very easily spread, and although an apparently healthy bird may be bought, yet it will carry the diseased germs with it. Therefore the greatest care must be exercised in introducing strange birds to an already healthy yard. Carefully examine all new arrivals, squeeze the nostrils to see if there is any discharge, examine the throat and windpipe for any appearance of yellow spots, and if there is the slightest doubt about the health, quarantine the new arrival for a week or ten days.

Roup generally starts with a slight cold, the symptoms of which are already described. Should the poultry-keeper be so indifferent or careless as to allow birds to remain running about with colds, roup is likely to develop, and will have got such a hold on the stock that the death of some, and the distressing symptoms shown by others, will at last have had the effect of drawing their owner's attention to the fact that his fowls are seriously ill, and that something will have to be done to prevent further loss or the total extinction of his flock. The symptoms by this time will be well developed—swollen eyes, filled with a thick cheesy matter, nostrils also discharging or clogged up, and mouth much ulcerated, loss of appetite, difficulty in breathing, and great weakness. Of cures there are hundreds, but whatever remedy is adopted, regular handling once or twice a day is necessary, which, besides being disagreeable work, also requires a fair amount of skill in carrying out; and even if a cure is effected it is not wise to use a bird that has been badly infected in the breeding pen. It may be necessary to use the knife to remove the cheesy matter by making a cut below the eye, extract as much offensive matter from the mouth as possible, wash out all the parts with a mixture of phenyle and water, apply crude phenyle to the bad parts in the mouth, and as a medicine, if none of the advertised " roup cures " are available, add sulphate of iron to the drinking water, or Parrish's chemical food. Feed only on soft food, seasoned with a little salt, ginger, and cayenne pepper. The following prescription is recommended by Lewis Wright :—

Balsam copaiba, 1oz.
Liquorice in powder, 4 drachms.
Pepperine.

Add sufficient magnesia to make a mass, make into 60 pills, giving one morning and evening.

Roup, in a diphtheric form, occasionally affects a single bird in an otherwise healthy yard; in which case immediately isolate the infected bird. The symptoms are a sudden and general depression and loss of appetite, accompanied by a swelling in the eye and a growth in the throat. Keep up the bird's strength by feeding on beaten-up egg. Extract the cheesy matter from the eye, and touch the spot where it was extracted from with a minute speck of pure phenyle; also apply some to the mouth. Other prescriptions for the same complaint are to paint the diseased mouth or throat with sulphate of zinc or the following :—

1 drachm carbolic acid
3 drachms sulphurous acid
½oz. tincture perchloride of iron
½oz. glycerine.

Scaly Leg is an unsightly affection of the shanks, consisting of a growth of scales and lumps, which are a source of considerable irritation to the fowl. A minute insect, invisible to the naked eye, is the cause of this disease, which by some authorities is said to be infectious, but such has not been my experience. It is fortunately easily cured by first removing as much of the growth as possible by means of soap and water applied by a nail brush. Then, with a small bit of wood, remove all growth from under the scales without bringing blood. Then thoroughly rub in a mixture of sulphur and lard. One or two applications generally affect a cure.

[NOTE :—The above article, together with the Lecture on Poultry published in the last number of the *Journal*, has been issued in pamphlet form and may be obtained on application to the Department.—ED. *Journal*.]

FRUIT-GROWING IN VARIOUS DISTRICTS.

By A. Vaughan.

The intending settler must often be in doubt as to which is the best district for him to settle in. In this article a few of the advantages and disadvantages of some of the districts, as far as fruit-growing is concerned, will be compared. It will be found that some districts have advantages over others for certain plants, and it would be of immense value to settlers if he knows what he can plant with a fair chance of success.

The orchards in some of our drier districts have not been the success anticipated, and there is no doubt that want of moisture and damage done by hot winds are the chief causes against success.

Those districts with an average rainfall of 16 inches (which falls in a few months) are not the best for apples and pears. Except with irrigation, or grown in very moist spots, they will not be a commercial success, especially when we remember that fruit will come down a lot in price. Besides the rainfall, you must study the temperature, as will be seen by comparing districts like Newcastle and Katanning. The average rainfall is much the same in each place, but Newcastle is hotter and suffers more from hot winds, a fact that shows its importance as far as viticulture is especially concerned. The grapes in the Newcastle district have to be picked directly they are ripe, or else they would soon be dried up, while at Katanning I have seen them remain on the vine when the leaves are off.

The hotter district is more suitable for a heavy wine and raisins, and is very free from fungoid diseases, sulphuring even hardly ever being necessary, except in patches. The cooler district will make a light wine, and ought to produce a bigger crop of grapes to the acre, while fungoid diseases will be more prevalent and harder to deal with.

Taking the country between Newcastle and Albany, following the railway line, I will try and point out a few of the advantages and disadvantages of the various districts.

From Newcastle to Beverley the climate is practically the same, and there is no doubt that intending fruit-growers will have the greatest success with plants that do not require a great quantity of moisture.

The great advantages of these districts are easy clearing, good weather at blossoming time, and freedom from fungoid diseases.

Early peaches, nectarines, Japanese plums, and vines seem to promise to be most successful, the conditions for citrous fruits are decidedly good, but, except in special spots, require more moisture than the average rainfall supplies; then there is the drawback of frost, in some seasons, affecting the citrous trees.

Apples and pears, except in moist spots, or with irrigation, can hardly be recommended to be grown on a large scale. These districts ought to have several irrigated orchards. They are naturally adapted for producing the finest quality of dried fruits, the conditions being naturally suitable, and for making a heavy-bodied wine and raisins. I may say the wines made from the white grapes promise to make a name for themselves.

From Beverley to Broomehill the rainfall remains much the same, decreasing every mile Eastward and increasing every mile Westward. Clearing is light, and the farther you get South the cooler it is, the consequence is that though you do not get a great deal more moisture in the land, the climate is cooler, and plants do not suffer so much from drought and hot winds; though in these districts you still want to pay great attention to the conservation of moisture, deep, well-drained land being always the ideal soil for fruit trees.

Stone fruits do well and, on good suitable soil, pit fruits, but judgment will have to be used, in planting for commercial purposes, to succeed in getting good matured fruit in payable quantities. It is worth noting that, in these districts, cherries promise to do well. The vine does well, and these districts should make a name for wines of a light character.

Fungoid and insect pests are troublesome and require to be kept in check.

From Broomehill to Albany we get into a 30-inch rainfall. Mt. Barker is, no doubt, an ideal district for pit fruit. This class of fruit is, and must remain, the staple industry of this part of the country; the land and climate being so suitable to it that it can compete with any other country in the world so far as these fruits are concerned. The clearing is heavy, and attention will have to be given to fungoid and insect pests.

Nearing Albany you have to be more careful in picking your land—exposure to heavy winds and bad drainage must be avoided; but, where soil and situation is suitable, some fine orchards are being made. Attention might be drawn to the lemon for Albany, choosing suitable well-drained soils and frostless situations. There are some trees growing that promise to do very well. Oranges and mandarins are not to be recommended, as the climate is not warm enough to ripen them properly.

Two orchards which show out prominently round Albany are owned by Mr. J. Rutherford, Torbay, and Mr. C. H. Neumann, and show what can be done on two totally different classes of country. Pioneering orchards like these are of immense value to the intending settler, as they demonstrate what the soil can produce. A debt is owing to all pioneering settlers who have shown what different soils and situations can grow, and what they have not been able to grow successfully. We still have a lot to learn as to the different plants, the best methods of clearing land, etc., and there remains a very great necessity for experiments to be carried on to practically demonstrate to intending and already settled settlers what is best to plant and how to do it. Nothing appeals to people so much as example. You may talk to them, and they will turn round and say, "Oh, that's all theory!"

More money perhaps has been wasted round Albany on the land than in most districts, on account perhaps of it being a difficult district to work, the distance from market, and the inexperience of some of the settlers. Some people who wish to go on the land very often like to stick close to the town, and don't consider the value of the land agriculturally, and I fancy you see more money in agricultural and horticultural pursuits in places that are situated near towns that are not purely agricultural centres, as there are always a certain number of business people who fancy it would be grand to have a farm, and these often have very little, if any, experience as far as land is concerned, and naturally make mistakes and have to pay for them.

Mr. C. Neumann's orchard is about nine miles from Albany, situated on the bank of a gully on a well-drained slope; light loamy soil, inclined in places to be gravelly. The clearing was very heavy, jarrah and red gum timber growing, with heavy underscrub. Apple trees have been planted mostly, and there is no doubt that this tree seems to do best. Stone Pippin, Rokewood, and Rome Beauty are the varieties that have been chiefly planted, and have given every satisfaction, especially the two latter varieties; they are four-year-old trees, averaging as much as a case to the tree and making plenty of wood, which shows that the trees have not been allowed to bear more than they were well able.

Mr. Neumann has also good vegetable growing land, and has been most successful with all his crops; in fact, has been able to plant his orchard from the money made from his vegetables, which he grows mostly in the summer time, and has not made the mistake of a good many settlers of trying to grow trees on low-lying and swampy soils, but has kept his trees on well-drained slopes, and this point cannot be too much impressed on new and old settlers alike around Albany: If they want to grow trees, to stick to the high ground and well sheltered positions. Mr. Neumann has gained success by hard work with head and hands, and he is to be congratulated.

Mr. J. Rutherford's orchard is on totally different country to Mr. Neumann's, being planted in the hilly karri country, about 17 miles from Albany. He has about 12 acres of orchard, and the main part of this is now bringing him in good returns. The apples which have given most satisfaction are Jonathan, Adam's Pearmain, Cleopatra, and Rokewood. Mr. Rutherford takes great care in packing and grading his fruit, which always brings top market prices.

The clearing is very heavy, but when the land is cleared it is very valuable, being of a loamy nature with a good clay subsoil. I am convinced that the karri country will make a name for itself, not only for its timber, but for agricultural and horticultural purposes. At present people prefer to tackle country that is not quite so heavy to clear, and there is no doubt that clearing is a great drawback; and I believe land would be taken up in these parts very rapidly if the Government could see its way to survey, say, blocks of 150 acres, fence and clear about 10 acres, and ringbark, and put the cost on to the land, to be paid off by the selector in instalments. The Government would be able to get the land cleared cheaper than the small settler, as they would be able to let a contract to clear a hundred acres, which would pay a man to get a good team of bullocks or horses and good tree-pulling machinery, which must reduce the cost of clearing below what a man with only mattock, axe, and spade can do it for.

Ten blocks treated in this manner as an experiment would not cost much, and would prove if it was a wise policy or not.

One of the blocks could be treated as an experimental plot, or at any rate an effort made to cultivate grasses and fodder plants, which, if proved successful, would be of immense value. Something should be done to try and get our heavily timbered country settled as quickly as possible, for the benefit of everyone, as these parts must naturally be the dairying and fruit-growing districts of Western Australia, and the sooner butter, eggs, etc., are cheaper, the better it will be for everybody.

Report on Cereals grown at Hamel, South-Western Railway, Season 1902-1903.

By G. F. Berthoud.

PART I.

Home Plots.

Soil.—Consists of a light loam of fair quality, but not heavy enough to obtain first-class results from the wheat. It is more suitable for growing oats. Has been in cultivation under various crops during the past five years.

Sowing.—All the cereals mentioned below were sown by hand, in shallow drills, 15 inches apart; seed used at the rate of 15lbs. and under per acre. This process is exactly similar to horse-power drilling, except that the rows are farther apart. The quantity of seed used is also considerably less.

Manure.—Applied in the drills with the seed at the rate of 2cwts. per acre, composed of—

Four parts superphosphates.
One part sulphate of ammonia.
One part sulphate of potash.

The above fertilizers are thoroughly broken up and mixed together shortly before using.

Cost.—Is at the rate of £1 2s. per acre. Bonedust alone, applied at the same rate, would cost less, and also give very good results, but not equal in weight of straw and grain to the complete manure.

Yields for grain and weight of straw are taken as follows:—An average drill, one chain in length, is selected from each plot, which is threshed and weighed separately, thus showing the respective productiveness of each variety grown under similar conditions.

Season.—The past year, taken as a whole, proved to be a good one in this locality. Although somewhat dry in the autumn and early winter, we had a fair rainfall during the spring and early summer months.

Wheat.—For this locality, where the rainfall is generally heavy, the mid-season or late varieties usually give the best results, which will be seen by reading and comparing the variety tests given below. The early sorts are the best for culture in drier districts, where they are not so liable to the attacks of fungoid diseases or to be damaged by the high winds which often prevail here during the early summer.

Oats.—The newer English varieties sent out by Garton have given good results for grain. The straw is, however, too coarse for good hay. The Algerian and other varieties of that class give a better quality of hay. Most varieties of oats do well in this district.

Barley.—This soil does not appear to suit the wants of this plant. The results obtained are not very satisfactory.

Rye.—Grows well, giving good yields of excellent straw, and also fair grain.

Poultry Feed.—The wheat, Galland's Hybrid, hardy and productive, well adapted for feeding purposes.

WHEAT.

Algerian.—Sown 8th May; growth upright, level, and even; colour bluish green; height when mature, five feet; ears large, heavily bearded; chaff and beard are white; ripe 6th December; yield light, at the rate of 14½ bushels per acre; unsuitable for general culture.

Farrer's Australian I/J.—Sown 10th May; growth upright, and very quick; leaf medium width; colour pale bluish-green;

level and very even; some plants showing heads on August 18; height when ripe, four feet; straw of fair quality, pale yellow. This variety is the earliest grown here, but like all the extra early kinds is not suitable for this moist district; should be very good for culture in the dry districts owing to its quick growth; ripe 15th November; ears three inches long, holds grain very well; hard to thresh; crop greatly knocked about by high winds; yield light, about 12 bushels per acre; grain plump and fairly good.

Banater.—Sown 8th May; growth upright, somewhat uneven and patchy; straw of fair quality, stands up well; mature height five feet six inches; ears medium size, heavily bearded, second early; yield light, at rate of 10½ bushels per acre; grain second-class; not profitable for general culture.

Farrer's Australian, x 62/f/.—Sown 10th May; growth even; foliage medium width; colour deep bluish-green; straw fine, but strong; stands up well; height five feet; level and fine on high part of plot, sickly on lower and wet portion; ripe 30th November; ears beardless, 4½in. long; good shape, and well filled; chaff pale dun; grain plump and good; yield: grain at the rate of 30 bushels per acre, straw at the rate of two and a half tons. Very promising new early variety.

Vermont and Jubilee (Australian, No. 167).—Selected local seed; sown 10th May; growth upright and vigorous; foliage wide pale green; straw rather weak, and liable to lodge in this locality; does not do well on low, wet land; height four feet six inches; level and neat; ripe 26th November; ears five inches long; beardless, good shape, well filled; chaff white; grain very long, white, and of good quality; yield: grain at the rate of 34 bushels, and straw two and a-half tons per acre. Productive variety, of quick growth.

Belotourka.—This is a Russian variety; sown 8th May; Growth at first low and creeping; leaf rather narrow, pale green; straw stands up fairly well; mature height to six feet, heads of fair size, heavily bearded; ripe 27th November; chaff and beards pale brown; grain yellow, medium size, plump; yield light, at rate of 13½ bushels per acre; healthy and hardy; early variety. May be useful in dry districts, but unsuitable for general culture.

Centennial.—Sown 8th May; growth even and healthy; colour distinct rich blue-green; straw strong, stands up well; height to six feet, level and fine; ears very large, heavy, well formed, long beards; some of which drop off when mature; ripe 14th December; grain large, white plump; strong, hardy, early variety; may be useful for growing for poultry feeding, etc. Yield, rate of 20½ bushels per acre. Sow early.

Federation (Farrer).—Sown 7th May; growth upright, quick, very even; leaf medium width, clean, and healthy; straw stiff, stands up well; height when mature five feet, level and neat; ears four inches long, nice shape, well filled; chaff brown; grain yellow, plump, and of good milling quality; ripe 24th November; yield grain at the rate of 32 bushels and straw 2½ tons per acre. First-class early variety, which should do well in the Eastern Districts.

Plover (Farrer).—Sown 9th May; growth upright, vigorous, and healthy; leaf rich bluish-green; straw clean and bright (not coarse), stands up well; mature height four feet six inches, fairly level; ripe 4th December; ears four inches long, well filled; chaff white; grain plump and large, pale yellow, of good milling quality; yield grain at the rate of 32 bushels and straw 2½ tons per acre. Very promising new early variety.

Mediah (Palestine).—Sown 8th May; growth healthy; foliage wide, pale green. This variety does not stool out much. Height to six feet, fairly even; straw of good quality, colour pale purple, with deeper shade close to the heads; ripe 27th November; ears of medium size; chaff and beard brown; yield light, at the rate of 11 bushels per acre; grain hard; early, but otherwise unsuitable for general culture.

Fullhead (Farrer).—Sown 10th May; growth at first slow and creeping; leaf narrow, deep green; straw clean and good, stands up well; height four feet six inches; rather sickly and uneven, owing to this plot being too wet in places; ripe 23rd December; heads of fair size, three and a-half inches long; chaff white, few short beards on tips; shells grain easily when fully matured; yield good; grain at the rate of 30 bushels, and straw two tons per acre; grain plump and good.

Lucky Talavera (Farrer).—Sown 11th May; growth slow; foliage dark green; height to four feet six inches; somewhat patchy and blighted in places; ripe 9th December; ears fair shape, four inches long, beardless; grain large and plump, pale red colour; yield: grain at the rate of 22 bushels, and straw, 1½ tons per acre.

Durum (Russian).—Sown 8th May; growth healthy and even; colour pale green; foliage narrow; height five feet six inches; fairly even; straw good, stands up well; ears of fair size, bearded; ripe 27th November; chaff and beards pale brown; grain hard, fair size; yield at the rate of 19½ bushels per acre; early and hardy, may be useful in dry places.

Dnyoon (Farrer).— Sown 11th May; growth slow but healthy; foliage deep blue-green, of medium width; height four feet, patchy, and uneven; ripe 14th December; ears three and a-half inches long, of good shape, and well filled, beardless; chaff white; grain plump and good; yield: grain 26 bushels, straw one and a-half tons per acre.

Doon (Farrer).—Sown 11th May; growth slow; habit when young low and creeping; leaf narrow, pale bluish-green; straw fine, fair quality, stands up well, clean and healthy; height to four feet, fairly level; ripe 14th December; ears three inches long, form pointed and thin; chaff white; few short beards on tips; grain good; yield, grain 20 bushels; straw one and a-half tons per acre.

Rymer (Farrer).—Sown 10th May; growth slow; foliage medium; colour pale bluish-green; height four feet, fairly level; straw good, stands up well; ripe 8th December; ears four and a-half inches long, rather thin in form; chaff pale brown, few sharp awns on tips; well-filled grain, large, yellow, and plump; yield: rate of grain 21½ bushels, straw one and a-half ton per acre.

Queen's Jubilee.—Sown 11th May; growth quick, strong, and upright; foliage wide, pale green, healthy, and good; height four feet, level, except on low part of plot, where the growth is poor. This variety does not like low, wet land. Straw, pale yellow, stands up well; ripe 1st December; ears three and a-half inches long, good shape, well filled; chaff white, few short awns on tips; grain plump, yellow; yield: rate of grain 27 bushels, straw two tons per acre.

Steinwedel and Jubilee (89).—Sown 16th May; growth strong and upright; foliage wide, pale bluish-green; height to five feet on high land; lower part of plot damaged by water; straw of fair quality; ripe 1st December; ears of good size, beardless; chaff white; well-filled grain, good, yellow, and plump; yield fair.

Yellow Bluestem.—Sown 13th May; growth slow; when young low and creeping; foliage medium, pale bluish-green; height 4 feet, somewhat patchy; straw clean bright yellow, stands up well; ripe 16th December; ears beardless, long and thin; chaff brown; grain medium size, yellow and white; yield: grain at the rate of 18 bushels, straw 1¼ tons per acre. The above is a distinct variety selected from a Manitoba wheat. Fair late sort.

Farrer's x 65/f/.—Sown 16th May; growth upright and vigorous; foliage pale bluish-green; straw fair quality, stands up well; height 4 feet, somewhat patchy owing to wet; ripe 27th November; ears beardless, of fair size; chaff white; nice grain; yield fair. Part of this plot destroyed by the rats.

Mold's Ennobled Red English Seed.—Sown 16th May; growth very slow; habit when young low and creeping; foliage very narrow; healthy dark green colour; height 4ft. fairly even; straw brownish purple of good quality; ripe 30th December; ears 3½ inches long; nice square shape, well filled, beardless; chaff red; grain medium size, plump and red; yield: grain at the rate of 27 bushels, straw 2 tons per acre; good English variety. Matures very late.

Mold's Ennobled White English Seed.—Sown 16th May; growth slow but slightly stronger than the red variety; foliage pale green, but healthy and even; height four feet three inches; straw white, stands up well; ripe 30th December; ears three and a-half inches long, beardless, nice square shape; chaff white; grain white, medium size, and plump; yield at the rate of: grain

27 bushels, straw two tons per acre. English wheats which mature very late would be useless in dry districts.

Majestic.—Sown 10th May; growth even and fine; foliage pale bluish green; straw clean and of good quality, stands up fairly well; height five feet, level and neat; ripe 28th November; ears four inches long, good shape, beardless, well filled; chaff pale brown; grain yellow, plump, and good quality; yield heavy: grain at the rate of 32½ bushels, straw two and a-half tons per acre; productive wheat, which originated in South Australia.

Minnesota.—Sown 16th May; growth slow; habit when young low and creeping; foliage narrow, deep blue green; height four feet six inches; fairly level; nice clean straw, stands up well and should make good hay; ripe 18th December; ears three inches long, beardless, thin, and pointed; chaff white; grain small, red, plump and velvety, superior milling quality; yield: grain at the rate of 18 bushels, straw one and a-half tons per acre. This sort should be sown early.

Missogen.—Sown 8th May; growth upright, even, and fine; foliage pale green; leaf medium width; stands up fairly well; height to five feet six inches; ripe 27th November; ears of good size, heavily bearded; chaff pale brown; yield fair, at the rate of 20½ bushels per acre; grain of medium quality; hardy early variety, but not suitable for general culture.

Farrer's 62/a/ new.—Sown 16th May; growth slow and creeping; foliage medium rich blue green; height four feet six inches; straw good, stands up well; ripe 20th December; ears beardless, fair average size, nice form, well filled; grain good; yield fair.

Farrer's 62/a/x new.—Sown 16th May; growth slow; habit creeping and low; foliage medium colour pale bluish green; height four feet nine inches; straw upright and good; ripe 20th December; ears good size and shape, beardless, well filled with nice even grain; promising.

Farrer's 75/a2/.—Sown 16th May; growth upright and vigorous; foliage broad; colour rich blue-green; height three to five feet, uneven, owing to part of plot having been flooded during spring; straw coarse, stands up fairly well; ripe 20th December; ears large, of good shape, and well filled with large grain; fair new variety.

Farrer's 2/h/ Power's Fife a.—Sown 16th May; growth slow; habit creeping; leaf narrow, colour pale blue-green; healthy; fairly even; appears to stand wet land better than most of the other varieties on this block; height four feet six inches; straw good, somewhat poor in patches; ripe 23rd December; ears medium size; grain small, red, good quality; yield light, not very promising.

Farrer's 53/a new.—Sown 16th May; growth slow; habit creeping; foliage medium width, colour deep green and healthy; height three feet to four feet six inches; straw stands up fairly well; ripe 20th December; ears beardless, large, and well filled; chaff white and velvety; yield fairly good. This variety is not thoroughly fixed.

Farrer's 60/a/v/61/a Withney Fife.—Sown 16th May; growth upright and healthy; foliage medium width, colour pale bluish-green; height to four feet six inches: straw of fair quality; ripe 20th December; ears of good size and shape, well filled. This plot uneven in growth, owing to wet soil. Fair late variety.

Farrer's 10/6/v/11/6.—Sown 16th May; growth slow; habit when young low and creeping; foliage wide; colour pale bluish-green; healthy and vigorous; height four feet nine inches; straw of fair quality, stands up well; ripe 20th December; ears beardless, well filled, large grain. Fair late variety.

Farrer's 10/6/v/11/6 (11.)—Sown 16th May. This seed partly failed to germinate on this plot. Growth slow; foliage wide; colour pale bluish-green and healthy; height four feet nine inches; straw of fair quality, stands up well; ripe 20th December; ears beardless, of good size and shape, well filled, grain of even size. Very similar to the last. Fair late variety.

Farrer's 12/6/v/13/6 (Type A.)—Sown 16th May; growth upright and vigorous; foliage wide; colour deep green, even, and healthy; height five feet six inches; straw large and strong and stands up nicely; ripe 20th December; ears large, beardless, well filled, grain good. Promising new variety.

Farrer's, 12/6/v/13/6 (Type B).—Sown 16th May; growth upright and good; foliage wide; colour pale bluish green; fairly even and healthy; height five feet six inches; straw large and strong, stands up well; ripe 23rd December; ears large, beardless, of good shape, and well filled; good late variety.

Tardent's Blue.—Sown 17th May; growth upright, vigorous, and healthy; foliage wide; colour deep blue green; height to five feet six inches; straw good, stands up well; a few patches in this plot damaged owing to wet; very good variety for hay or grain in the coastal districts; ripe 13th December; ears four and a-half inches long, beardless, pointed, well filled; chaff white and velvety; grain yellow, good quality. Yield at the rate of: grain 22½ bushels, straw two tons per acre.

Bluestem (True).—Sown 17th May; growth slow; habit when young low and creeping; foliage narrow; colour deep green and healthy; the growth on this plot is somewhat uneven, owing to excessive wet in spring; height to five feet; straw fine, but fairly strong; ripe 18th December; ears three and a-half inches long, beardless, pointed, rather loosely filled; chaff pale dun; grain red, small, good milling quality. Yield at the rate of: grain 18 bushels, straw one and a half tons per acre. This is an American variety.

Galland's Hybrid.—Sown 19th May; growth good; habit low and creeping when young; colour rich blue green; healthy and fine; rather short and sickly on wet places, prefers well drained land;

height to five feet six inches, fairly even; straw strong, stands up very well, does not stool out much; ripe 20th December; ears large, nice shape, heavy and well filled; grain very large, white bearded; chaff white; most of the beards fall off when mature. Yield at the rate of: grain 36 bushels, straw two tons per acre; hardy and prolific; should be grown for poultry, etc.

Farrer's 40/e/.—Sown 21st May; growth upright and very robust; colour pale green; healthy; the plants do not stool out much. This variety appears to stand the wet soil better than the other early sorts. Height four feet, level, and fine; ripe 20th November; ears beardless, of fair size, well filled; grain white and plump; yield fair; suitable for trial in dry districts.

Australian King.—Sown 20th May; growth upright; foliage medium; colour pale bluish green; height four feet six inches; straw stands up fairly well; ripe 13th December; ears beardless, four inches long, thin and pointed; chaff deep brown, very distinct in colour; grain fair size, bright yellow. Yield at the rate of: grain 18 bushels, straw one and a half tons per acre; hardy. South Australian variety.

Farrer's 40/c/.—Sown 21st May; growth upright and vigorous; colour light green; healthy, except in wet places, where it is yellow and sickly; height three feet six inches; straw rather weak, falls over badly; may be useful for dry districts, but unsuitable here; ripe 30th November; ears beardless, small, well filled; grain white, plump, of fair quality. Yield moderate.

Silver King.—Sown 20th May; growth when young low and creeping; foliage medium width; colour pale blue green, healthy and good; height five feet, fairly level, except in wet patches; straw stands up nicely; ripe 8th December; ears four inches long, thin, fairly filled, beardless; chaff pale brown; grain yellow, good. Yield at the rate of: grain 19 bushels, straw one and a half tons per acre. Fair variety from South Australia.

SPELTZ WHEATS (*Triticum Spelta*).

The following varieties are a very distinct type, said to be hardy and prolific, giving better results on poor soils than the kinds commonly cultivated. From the tests made here during the past two seasons the results obtained have not been very encouraging. In all the varieties the chaff adheres firmly to the grain, and does not shell off in the process of threshing, which is a point in their favour for hay-making and against shelling out during rough weather; nor are they easily destroyed by birds. The Dinkel is the most promising for hay:—

Dinkel Speltz (Triticum Spelta).—Seed received from Dr. A. Morriston; sown 21st May; growth good; foliage medium width; colour dark green, healthy and even; height four feet, level and fine; straw clean and of good quality; ripe 18th December; ears long and thin, beardless; chaff brown; good grower, one of the best in this State; may prove useful to grow for hay only.

Black Speltz.—Sown 21st May; growth at first slow and creeping; foliage very narrow; colour deep bluish green; healthy; height four feet six inches; straw stiff, stands up nicely; ripe 19th December; ears of fair size, two and half inches long, thick set, well filled; chaff and long beards are black, giving this variety a very curious and distinct appearance. Yield at the rate of: grain 24 bushels, straw one and a-half tons per acre. Hardy, healthy grower, not suitable for general culture.

Speltz, White, Beardless.—Sown 21st May; growth creeping and weak; foliage narrow; colour dark green; distinct sort, of very slow growth; height three feet; straw fine and fairly strong; ripe 27th December; ears four inches long, thin, and loose set; chaff white. Yield at the rate of: grain 16 bushels, straw one ton per acre. Late variety unprofitable to grow for grain or hay.

Speltz, White, Bearded.—Sown 21st May; growth creeping, fairly vigorous; foliage very narrow; colour deep green; healthy and even; height four feet; fine clean straw, stands up well; ripe 19th December; ears three and a-half inches long, thin, and loosely fitted; chaff and beards white. Yield at the rate of: grain 16 bushels, straw three-quarters ton per acre. Not desirable.

Speltz Two Rowed.—Sown 21st May; growth slow and creeping; foliage narrow; colour pale green, healthy and clean; height three feet six inches; fairly level; straw fine and wiry; distinct from all other sorts grown here; ripe 21st December; ears small, of distinct form; the grain is set in two rows like barley; chaff and beards white. Poor late variety.

Emmer Starch.—Sown 21st May; growth upright; foliage wide; colour pale bluish-green; healthy and even. This variety seems to do very nicely on low wet soil; height, four feet; the earliest sort in this class; ripe 8th December; ears three inches long; chaff and beards pale dun. Yield light, at the rate of: grain 14 bushel, straw three-quarters of a ton per acre. The grain of this wheat is used for making starch.

OATS.

Garton's A.—Sown 5th May; growth fine, stiff and upright; foliage medium width; stands up nicely; clean and healthy; height to five feet six inches; straw strong and coarse; unsuitable for hay; ripe 5th December; heads open and spreading; grain long white; good for feeding purposes. Yield at the rate of: grain 44 bushels, straw three tons per acre. English variety.

Garton's B.—Sown 2nd May; growth upright, very strong and fine; foliage wide, pale green; healthy; height to five feet six inches;

fairly level; straw, rank, too coarse to be suitable for good hay; ripe 2nd December; heads wide and spreading; grain long, pale, yellow, rather thin. Yield good, at the rate of: grain 46 bushels, straw 3 tons per acre. English variety.

Garton's C.—Sown 6th May; growth even, strong, and healthy; habit upright; foliage pointed, medium width; colour dark green; height to six feet six inches, fairly level; straw of good quality, somewhat coarse for good hay; ripe 28th November; heads large, spreading, well filled; grain white, heavy, excellent for feeding, Yield at the rate of: grain 65 bushels, straw 3½ tons per acre. Superior English variety.

Garton's D.—Sown 6th May; growth robust; foliage very wide; colour dark green; even and healthy; height to six feet; straw coarse, somewhat rusty in places; ripe 5th December; heads of fair length; grain on side, well filled. This variety has a serious fault, the heads are very liable to break off at the top joint when ripe; grain white, heavy, and good. Yield at the rate of—grain, 47 bushels; straw, three tons per acre. English variety.

Chinese Hulless.—Sown 6th May; growth very even, healthy, and good; foliage medium width; colour pale green; height five feet six inches, level and neat; straw not coarse, good quality for hay, inclined to lodge in places; ripe 25th November; heads wide spreading, nice shape, well filled; grain white, small, soft, and hulless; excellent for poultry and also for meal. Yield at the rate of: grain 39 bushels, straw three tons per acre; good variety for this locality.

Early Ripe.—Sown 6th May; growth even and good; foliage medium width; colour pale green; height five feet six inches, level and neat; straw clean, of good quality for hay; ripe 17th November; heads wide and open and well filled; grain long, pale dun colour, fairly plump; yield at the rate of: grain 32 bushels, straw 2 tons per acre; superior early American variety for dry climate.

Grey French.—Sown 6th May; growth upright, clean, and healthy; foliage narrow; colour pale bluish green. This appears to be a wild type, very hardy and distinct; height 6 feet, level and neat; straw fine, but stands up fairly well, good for hay or green feed; ripe 10th December; heads small and open; colour bluish-green tinted with purple; grain grey-bearded and very small, useless for feeding; yield at the rate of: grain 14 bushels, straw 2½ tons per acre.

Grey Winter.—Sown 7th May; growth even and good; habit low spreading, close to the soil; foliage narrow; colour pale bluish-green; height 5 feet, neat and level; straw of good quality for hay, slightly rusty on flag, also liable to smut; ripe 24th December; heads of fair size, open; grain long, grey, fairly plump; yield at the rate of: grain 36 bushels, straw 2 tons per acre, late variety.

Black Winter.—Sown 7th May; growth healthy; habit very similar to grey winter; the foliage is rather wider; height 4 feet 6 inches; fairly even; straw of good quality, slightly rusty on flag, and liable to smut; ripe 22nd December; grain black, long, plump; heads open and spreading; yield at the rate of: grain 34 bushels, straw 1½ tons per acre, late English variety.

Early Hulless.—Sown 8th May; growth upright; foliage narrow; colour pale green; healthy; height 3ft. 6in., neat and level; straw fine, stands up fairly well; ripe 25th October. This is the earliest oat grown here. Heads open and spreading; grain hulless, yellowish-white, very small; yield light. May prove useful for culture in dry places, where the growing season is short.

No. 23.—Sown 7th May; growth quick and vigorous; habit upright; foliage, medium width; height five feet six inches; level, clean, and healthy; straw of good quality for hay; rapid grower and valuable for dry districts; ripe 19th November. Heads large, open, and well filled; grain dun colour, long and plump; yield good: grain at the rate of 50 bushels and straw 3 tons per acre. South Australian variety, and one of the best.

Ligowa Improved.—Sown 8th May; growth stiff and upright; foliage wide; dark green colour; height five feet; rather uneven; straw very rank and coarse; stands up well; ripe 25th November; heads wide and open, badly filled; grain white. Yield light, at the rate of 16 bushels per acre. This variety does not give profitable results.

Silvermine.—Sown 8th May; growth fair; foliage wide and drooping; colour dark green; height four feet six inches; straw very coarse, poor quality; ripe 25th November; heads open and spreading, badly filled; grain large white; yield very light, 13 bushels per acre. American variety not suitable here.

Vick's Banner.—Sown 8th May; growth good; foliage wide; colour pale green; drooping; height four feet six inches; straw coarse; ripe 29th November; heads open and spreading; grain white, long, and thin; yield light, at the rate of: grain 20 bushels, straw 1½ tons per acre. American variety not desirable.

Grey Houdan.—Sown 7th May; growth slow; foliage narrow; colour pale bluish-green; plant stools out well; height four feet; straw fine, of good quality for hay; very uneven, especially on lower part of plot, where the soil is wet; ripe 13th December; heads open and spreading; grain grey, of fair size; yield light; results not promising.

Jounnette.—Sown 7th May; growth healthy and fairly even; height to five feet; straw of good quality for hay, slightly rusty on flag; ripe 15th December; heads open and spreading, fairly filled; grain black, plump, and heavy; yield at the rate of: grain 33 bushels, straw 2 tons per acre; Swiss variety.

BARLEY.

German Beardless.—Sown 8th May; growth fair; leaf pale green; sickly and uneven in patches; height three feet; straw fairly good; ripe 29th October; ears long, thin, flat shape, and beardless, which gives it a very distinct appearance; grain white, fair size; yield light, not suitable for profitable culture in this locality.

Red Californian.—Sown 8th May; growth upright and vigorous; height to four feet, fairly even; straw good colour, pale purple; ripe first week in November; ears large, nice shape, and well filled; grain reddish white, plump; yield at the rate of 21 bushels per acre. Good hardy malting barley.

Italian.—Sown 8th May; growth strong, healthy, and even; height three feet six inches, level and neat; good straw, stands up well; ripe 25th October; ears flat shape (2), two-rowed, well filled with heavy white grain; yield good, at the rate of 29 bushels per acre; hardy and productive. Malting variety.

Manshury.—Sown 8th May; growth quick, strong, and healthy; height to four feet, nice and level; good straw; ripe 20th October; ears large, six-rowed, well filled; grain medium size, yellowish white; yield, 15½ bushels per acre. Fair American variety for feeding purposes; not malting.

RYE.

Summer Saxon.—Sown 5th May; growth even and fine; foliage deep bluish green; habit, when young, spreading close to the soil; height six feet, level and neat; straw not coarse, of good quality, stands up well; ripe, 14th December; ears long, fairly filled; grain plump, medium size; yield at the rate of—grain, 28 bushels; straw, 2 tons per acre. Good medium early variety.

Giant.—Sown 5th May; growth even; habit, at first low and creeping close to the soil; foliage narrow, colour pale bluish green; height six feet, level and good; straw strong and stiff, stands up very well; ripe 18th December; ears large and well filled; grain long and plump; yield good; grain at the rate of 32 bushels; straw, 2½ tons per acre. Superior variety for grain or straw.

[The balance of this report will be concluded in the next issue.—ED. *Journal.*]

CURRENT POULTRY NOTES.

By F. H. Robertson.

Early Hatching.

The present is the most important time in the year to the poultry breeder, as the months of May, June, and July are the very best for hatching chickens, so as to obtain a supply of eggs when they are dearest, viz., during the months of February, March, April, and May, and very nice prices they are reaching now, the store retail selling prices touching 3s. 6d. a dozen, while the wholesale auction quotations range from 2s. 6d. to 3s. 3d. All through the whole of March and April they have been very firm, and during April rarely lower than 3s. Chickens of any of the good laying breeds, if hatched during the cold weather, although requiring a little extra attention in providing shelter from the wet, are hardier than those hatched later in the year; they grow quickly, and if properly fed and housed should commence to lay at six months old; that is, supposing chickens are hatched in July, eggs should be produced in January, whereas those chickens hatched in, say, November are not likely to lay until they are eight or nine months old, viz., in July and August, when eggs are cheap, besides having had to feed them for an extra two or three months before yielding any profit; neither are they as large or strong as the winter-raised chickens, therefore I cannot too strongly urge the necessity of early hatching if the best profits are to be made.

There are, of course, obstacles in the way of early hatching, the principal one is the difficulty in getting a sufficient number of broody hens, this can be overcome by having recourse to the incubator, which frequently is of great service at this time of the year, even in yards where the use of the hens is the regular means of incubating. Hens have a knack of doing what they ought not to, and not doing what they should. It is very aggravating to have a lot of valuable eggs waiting for broody hens, at the most important time of the year, and to prevent the risk of being stuck up in this manner, the careful poultryman has his incubator in readiness—and is thus able to get an early start, and also secure the cream of his eggs, as the hens which start laying first are the ones whose progeny are likely to also possess this valuable quality.

Treatment of Newly Purchased Poultry.

It is not an uncommon occurrence for newly bought fowls to live but a very short time with their new owner, notwithstanding the fact that the birds when in the breeder's yard were the "picture of health." The cause of their demise is frequently not apparent, and in the absence of all signs of tick, roup, cholera, etc., it is rather a puzzle to find out what was wrong. In many cases it is due to injudicious feeding of the new arrivals with hard grain, or excessive drinking after a long fast during the progress of their journey from the old to the new yard, during which period neither food or water were available; the general inclination is to give the new fowls a liberal supply of feed and water; the proper course is to give only small quantities of each at intervals of a few hours, never giving the fowls as much as they will take; feed only soft food, no hard grain should be given for the first day or two.

In purchasing poultry it is, if possible, advisable to know under what conditions of housing and feeding they were accustomed to when with their former owner; supposing they had been in the habit of an entirely open air existence with unlimited run and roosting in the trees at night time, if these same birds are enclosed in a small snug run, and perch in a warm and badly ventilated house at night time, they are very liable to contract colds and roup, and if the reverse treatment is given, they may also go wrong owing to being unable to rough it. Birds from a well kept yard, where they have been accustomed to nothing but perfectly clean water and the best and sweetest of feed, are particularly liable to be affected with dysentery, cholera, etc., if given sunburnt or dirty water or stale or sour food; it is something to which they are quite unaccustomed and disaster is the result. Many a good and careful breeder of fine healthy stock has, in this manner, been unjustly blamed for selling sickly or pampered stock, when in reality the purchaser is himself at fault, owing to careless and injudicious housing and feeding. All fresh birds should be kept separate for a few days, to make sure that they are quite healthy; and, on taking them out of the crate, look down the throat to see if quite clear of white or yellow spots, especially round the wind pipe and under the tongue, then press the nostrils to ascertain if there is any discharge, next look for lice, and if there are any, thoroughly dust the feathers with insectibane.

Mode of Incubation.

Now that the breeding season is at hand the question naturally arises as to the best mode of hatching chickens, whether by incubators, hens, or turkeys. Each one is best, or all are best, just according to conditions or what is required. For the ordinary back-yard breeder, who only has accommodation for 20 or 30 fowls, it is quite unnecessary to run a machine, as all the chickens required can be hatched under hens, unless he wants to make a speciality of selling ducklings just out of the shell, which, if properly worked, is quite profitable, or the selling of day-old, pure-bred chickens is another good paying branch of the poultry business which is quite neglected here.

The incubator, as already pointed out, is invaluable for early hatching, but whatever make is selected let it be a good one, with a copper tank; iron tanks should never be put into incubators, as they soon rust through and cause no end of trouble.

The novice in poultry rearing frequently starts operations by purchasing an incubator even before he has got any fowls. This is quite wrong, and is a case of putting the cart before the horse, and even it is unwise for the inexperienced to use an incubator for the first season, much better to devote at least one season to becoming thoroughly acquainted with chicken management hatched under hens.

EGG PRESERVATION.

The question of egg preservation receives but little attention in this State, which is rather to be wondered at when one considers the wide margin in prices there is to work upon, viz., from 10d. to 3s. 4d. per dozen. The writer, some five or six months ago, with the view of obtaining some reliable data, decided to make a few experiments by storing eggs under various conditions, the results were very satisfactory, and were as follows:—Five dozen eggs, none more than a week old on 8th December, 1902, put into a kerosene tin, half filled with water, into which was mixed half a pint of silicate of soda, price 1s., commonly known as Water Glass. These eggs were used as required by the household, and all turned out with unbroken yolks, very good for puddings, etc., but not first-class as boiled, after being in the preservative for three months. Beyond that period the difference between them and new laid eggs being decidedly pronounced, and in some instances disagreeable. About two months prior to the above, a kerosene tin full of eggs were set in "Ovo," the result being about the same as in the silicate of soda. Apart from a tendency for eggs to crack in boiling, both the above tests can be considered satisfactory. The cracking can, to a certain extent, be decreased by pricking the eggs before placing them in the boiling water.

The next test was in cold storage, at a temperature of 30°, with 18 perfectly fresh eggs, on 22nd October, 1902, placed in a cardboard box, perforated to allow a current of air, eggs laid on their side, touching each other, and without any packing. Three eggs were taken out on February 2nd, and boiled, tasting quite fresh. The remainder were taken out in April, and when boiled or fried were undistinguishable from fresh eggs.

The next test was in cold storage in the same chamber as the last-mentioned lot. A patent egg-box was obtained; and in case my readers do not know what one is like, the following is a description:—The one used contained six dozen eggs; the case is of wood, and allows a free current of air; there are three removable trays, each made to hold two dozen eggs, in which small wire frames are made, which firmly grasps each egg tight enough to prevent them dropping out, even if the box is turned upside down; the eggs do not touch one another; 6s. 6d. is the cost of the case, which is undoubtedly the very best mode of sending eggs to market: its cost is the only objection it has.

The first tray contained two dozen perfectly fresh Minorca eggs; the next, two dozen Adelaide eggs, probably quite three weeks old from the time they were laid; and the last, two dozen country eggs, supposed to be quite fresh. All these eggs were placed in cold storage on 25th November, 1902. On 30th March, 1903, two eggs from each lot were taken out and broken, all turned out with unbroken yolks, one lot being undistinguishable from the other. All the eggs were taken out on 27th April and used in the household. The Adelaide eggs were fit for frying, puddings, cakes, etc. The York eggs were all right fried or for boiling, but the local fresh laid Minorca eggs were almost as good as new laid for boiling during the first week but after that time they became rather stale.

These tests were all decidedly in favour of the cold storage system, which, however, is by far the most expensive, still it would probably yield a handsome profit if carefully conducted on a large scale. The Water Glass and Ovo systems are also of great service to the ordinary poultry man who has more eggs than are required for the household during the spring time. Instead of selling his fresh eggs when the market is full and prices low, if the surplus is placed in preserve they come in very nicely during the dear months of March, April, and May.

The sixth annual open laying competition of the Utility Poultry Club began on October 22, 1902, and ended on February 10, 1903—a period of 16 weeks. The pens, each of which contained four 1902 pullets, were under the management and personal supervision of Mr. C. H. Payne, Highclere, Newbury, Bucks. The results were as follow:—

Pen.	Breed.	Total Eggs.	Points.	Order.
13.	Wyandottes, White	276	551	1
22.	Orpingtons, Buff	225	444	2
23.	Orpingtons, Buff	200	371	3
24.	Orpingtons, Buff	177	345	4
11.	Wyandottes, Golden	181	332	5
16.	Leghorns, White	174	324	6
12.	Wyandottes, White	154	305	7
21.	Orpingtons, Buff	141	275	8
14.	Wyandottes, White	148	273	9
1.	Langshans	134	258	10
15.	Wyandottes, White	129	251	11
8.	Lincolnshires, Buff	166	247	12
7.	Leghorns, Black	134	239	13
5.	Anconas	116	227	14
6.	Wyandottes, Silver	144	219	15
20.	Wyandottes, Silver	118	217	16
4.	Leghorns, Brown	97	189	17
18.	Wyandottes, Silver	105	182	18
9.	Plymouth Rocks, Barred	93	179	19
19.	Wyandottes, Silver	86	158	20
10.	Wyandottes, Golden	87	143	21
2.	Minorcas, Black	67	134	22
17.	Leghorns, White	63	124	23
3.	Wyandottes, Buff	59	84	24

N.B.—Every egg weighing 1¾oz. or under scores one point; exceeding 1¾oz. two points.

The winning pen was owned by a lady.

GARDEN NOTES FOR JUNE.

By Percy G. Wicken.

The ground will now be getting wet and cold, and therefore all garden work should be pushed on with, and as many seeds as possible should be planted, so as to get the benefit of the early rains. The soil is warm when the rains start, and as soon as the seeds get the warmth and moisture they make a rapid growth, but take much longer to germinate when the ground becomes cold. All autumn-sown seeds should be sown in time to benefit by the early rains. The early frosts will, in most districts, kill the few remaining tomato or French bean plants that may still be bearing; but there should be a good supply of cabbages, cauliflowers, broad beans, kale, etc., coming on for the winter. All these plants are improved rather than hurt by a light frost. In the higher and well-drained portions of the State these vegetables should be plentiful; while the swamp land will be getting too wet to yield good results. In all rich humus and garden soils which have been well manured for some time past the application of a dressing of caustic lime will prove of benefit. The lime acts on the vegetable matter in the soil and makes a quantity of the nitrogen contained in the humus available for plant food; it also liberates a quantity of potash from its various compounds, so that the plants can absorb it. Lime is not required as a manure in itself, but makes the manurial ingredients in the soil more readily available.

A liberal supply of manure is required to make the crops grow quickly and to give the best results. Turnips and swedes require plenty of superphosphate; potatoes, plenty of potash and nitrogen; peas and beans, superphosphate and potash. Cabbages and cauliflowers are greatly improved by a dressing of sulphate of ammonia, spread along the rows at the rate of from 1cwt. to 2cwt. per acre.

Asparagus.—Get a trench dug and well manured, ready to plant out the roots early in the spring.

Broad Beans.—Sow a few rows every week, so as to keep up a succession and have a plentiful supply of fresh green beans coming on.

Cabbages.—Sow a little more seed, so as to have some plants coming in for future use. The seed should not be sown thickly in the beds, as this causes the plants to grow long and spindly, and after transplanting they either die off or take a long time to recover. The seeds, even in the beds, are better sown in drills; and they can then be thinned out, and healthy plants obtained.

Cauliflowers.—Sow a few seeds for future transplanting; otherwise, treat the same as cabbages. Cauliflowers require to grow quickly and without any check. The application of liquid manure is of great benefit to them.

Carrots.—Sow a few rows of the shorthorn variety in drills about one foot apart and one inch deep. Thin out those already coming up, and keep the beds free from weeds.

CELERY.—Plant out in a trench which has been well manured any plants you have available; those that are farther advanced should be well earthed up, in order to blanch them and make them tender, but no earth must be allowed to get into the heart of the plant.

LEEKS.—Plant out any young plants you may have, and sow a further supply of seed in a seed bed, which should be planted out as soon as the plants reach six to eight inches in height. Leeks should be planted out in shallow trenches, first trimming off their roots and slightly cutting back their leaves.

LETTUCE.—Sow a little seed in seed bed, and plant out any seedlings you may have ready. They should be planted out about one foot apart each way. The distance will vary with the variety.

ONIONS can still be sown in seed beds; and those seedlings which have grown sufficiently can now be planted out. Onions should not be planted too far apart, unless large-sized ones are required. The drills should be about one foot apart, and the plants from six to eight inches apart in the rows.

PEAS.—Sow a few more rows to keep up a succession, or a larger area if growing for market. Pull up all old plants which are not bearing well, and sow something fresh.

TURNIPS.—A further supply may still be sown; and those plants already up will require to be thinned out. The young ones are very acceptable for the table, and may be thinned out of the bed as required for use.

RADISH.—Sow a little seed from time to time. This vegetable is splendid for the table if quickly grown, but, if of slow growth, is tough and indigestible. It requires plenty of good liquid manure to force it along.

FARM.—All available horses should be engaged at ploughing, preparing the land, and sowing the cereal crops; the early-sown crops almost always give the best results. Those who have large areas of fallow ground are able to get most of their sowing done early in the season; while those who have to wait for rain before they are able to commence their ploughing are dependent on the weather, and are a good deal later in getting their crops sown. Much better results are to be obtained by fallowing all wheat land in rotation than by continuously cropping it year after year without a change. The application of phosphates of lime as a manure will, in most of our Eastern districts, prove of benefit, and turn out to be a profitable investment. Lucerne is a very valuable crop, and could be successfully grown in many of our districts. The roots penetrate the soil to a great depth in search of water, and, when once established, will resist to a great extent the dry weather, and yield a heavy supply of succulent fodder during the hot weather. It deserves much more attention from the hands of our farmers than it has yet received. *Paspalum dilatatum* and *Paspalum virgatum* (both roots and seed) may be planted during the present month, and will obtain a fair root-hold before the hot weather comes on them, and give a much heavier yield next summer than if sown in the spring. If the sowing of these grasses are left too late, there is a possibility of the ground being too cold for the seed to germinate. If the soil is becoming too wet, plough-furrows should be run round the headlands, and also through the paddocks if necessary, following the fall of the land, so as to enable as much of the water as possible to get away. Stagnant water is very injurious to almost all crops.

THE CLIMATE OF WESTERN AUSTRALIA DURING APRIL, 1903.

During the last month the atmospheric pressure was lower throughout the State than the average, especially in the South-West and South, while the temperatures were again below those for previous years. South of the tropics the mean was about 2° below normal, and at Perth the mean day temperature 5° below, while the night temperature was about normal.

From the "Interstate Table" it will be noticed that the mean Perth temperature was higher than Melbourne and lower than Sydney.

During the nights frosts were experienced inland, as may be seen from the appended table giving the mean and lowest temperatures recorded on the surface of the ground:—

TERRESTRIAL MINIMUM RADIATION.

Station.	Mean.	Lowest.	Date
Cue	—	—	—
Coolgardie	41·0	26·0	25
Southern Cross	45·5	30·0	25
Walebing	44·6	34·0	7
York	46·0	32·0	25
Perth Observatory	50·6	35·9	25
Wandering	—	—	—
Katanning	43·0	28·0	10
Bridgetown	41·6	30·0	26
Karridale	45·0	31·0	26

The heaviest rainfall recorded for April was experienced in the Kimberley district, about an average in the North-West and Murchison, and rather above the average in the South-West and South, including the Coolgardie Goldfields, but throughout the State it was very "patchy." About one and a-half miles North-East of Northam a very heavy downpour occurred on the 14th, while only 20 points were recorded at the local post office, and in the North-West, at Wogoola station, nearly five inches fell from the 12th to 14th, but only three points at Winning Pool, about 40 miles to the West.

The disturbance which gave heavy rain in the tropics between Derby and Nullagine from the 16th to 18th passed in a South-East direction across the continent, and heavy rains commenced to fall on the 19th at Alice Springs, and spread throughout South Australia and the Eastern States.

The Climate of Western Australia during April, 1903.

	Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
						April, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham ...	29·866	29·912	30·073	29·714	94·0	79·0	86·5	100·2	71·6	95·9	77·0	103·2	63·5	287	4552
	Derby	29·874	29·922	29·983	29·753	92·5	74·3	83·4	98·6	69·8	96·3	70·3	103·2	55·0	842	2187
	Broome ...	...	29·922	...	...	90·7	75·0	82·8	100·7	69·5	94·3	71·0	102·4	56·0	625	1608
	Condon ...	29·886	29·953	29·995	29·779	88·4	69·8	79·1	95·8	61·0	90·5	65·4	103·0	46·0	475	897
	Cossack ...	29·884	29·968	30·030	29·758	90·0	70·8	80·4	98·0	65·5	91·5	70·1	105·0	59·7	103	892
	Onslow ...	29·890	29·960	30·050	29·760	89·0	68·0	78·5	96·0	62·0	92·4	67·4	105·0	53·0	1	247
	Carnarvon ...	29·956	29·999	30·165	29·798	81·1	62·8	72·0	98·0	52·4	83·4	64·3	108·0	46·0	42	58
	Hamelin Pool...	29·967	30·012	30·228	29·794	82·4	59·5	71·0	98·4	51·8	86·2	62·0	105·6	50·0	59	59
	Geraldton ...	30·025	30·068	30·350	29·720	76·3	58·3	67·3	91·0	42·0	78·3	59·4	99·4	45·5	34	77
Inland:	Hall's Creek *	29·937	29·979	30·149	29·715	88·6	68·8	78·7	97·0	59·0	92·4	62·7	102·0	47·0	470	3127
	Marble Bar ...	...	...	...	...	94·0	70·0	82·0	105·0	62·0	...	...	...	...	145	622
	Nullagine * ...	29·887	29·986	30·213	29·743	90·0	66·4	78·2	98·0	59·0	90·1	60·5	99·8	41·0	307	541
	Peak Hill ...	29·960	29·997	30·230	29·750	81·0	59·0	70·0	95·0	49·0	84·0	62·1	95·8	49·4	117	180
	Wiluna ...	29·965	...	30·341	29·695	80·1	55·5	67·8	93·7	39·6	...	...	...	...	39	138
	Cue	...	30·040	...	...	...	...	...	94·8	42·4	85·1	60·5	101·0	41·0	27	66
	Yalgoo ...	29·990	30·044	30·370	29·720	79·0	55·0	67·0	91·0	44·0	84·2	58·8	102·5	42·3	Nil	76
	Lawlers ...	29·992	30·061	30·359	29·624	77·0	55·4	66·2	95·2	40·8	81·8	58·4	98·1	39·4	97	394
	Laverton ...	30·020	30·108	30·443	29·715	76·8	54·3	65·6	96·8	38·4	79·9	56·6	96·9	43·0	53	453
	Menzies ...	30·020	30·086	30·450	29·630	73·8	53·1	63·4	95·7	40·6	79·3	56·4	98·0	37·0	127	590
	Kanowna ...	...	...	...	...	...	...	...	...	38·5	...	...	...	...	113	200
	Kalgoorlie ...	30·030	30·110	30·459	29·581	72·6	52·0	62·3	94·8	39·0	78·0	55·1	96·2	38·8	171	203
	Coolgardie ...	30·020	30·104	30·440	29·590	72·0	51·0	61·5	94·0	38·0	77·9	54·1	97·8	39·1	103	165
	Southern Cross	30·015	30·081	30·440	29·650	73·7	49·9	61·8	89·2	34·2	79·1	51·7	98·0	31·7	113	183
	Walebing ...	...	...	...	...	73·3	51·1	62·2	88·0	37·0	...	...	...	...	140	350
	Northam ...	...	...	...	...	72·9	51·4	62·2	87·2	37·1	...	...	...	...	127	178
	York	30·055	30·103	30·480	29·670	71·0	49·0	60·0	85·0	35·0	79·1	51·4	100·2	34·5	115	150
	Guildford ...	...	...	...	...	73·5	51·7	62·6	88·0	41·5	...	...	...	...	255	289

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Climate of Western Australia during April, 1903—*continued*.

	Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
						April, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast:	Perth Gardens ...	30·059	30·109	30·473	29·728	71·8	54·6	63·2	86·0	44·0	77·7	54·9	106·5	41·0	268	298
	Perth Observatory	30·060	30·104	30·477	29·719	71·0	54·7	62·4	85·7	44·2	75·6	56·7	97·4	42·4	216	238
	Fremantle ...	30·072	30·093	30·469	29·738	70·2	57·3	63·8	82·0	47·2	73·7	58·8	93·6	46·4	314	358
	Rottnest ...	30·048	30·042	30·458	29·722	69·0	57·0	64·0	81·0	51·2	72·4	60·6	91·0	47·8	315	330
	Mandurah ...	...	...	...	...	71·1	50·3	60·7	83·5	37·8	...	...	...	...	275	316
	Wandering ...	...	...	...	...	67·6	46·2	56·9	81·6	32·0	...	...	...	...	263	286
	Collie	...	...	...	...	67·9	43·7	55·8	81·1	30·8	...	...	...	...	231	292
	Donnybrook ...	...	...	...	...	69·1	46·5	57·8	83·2	33·4	...	...	...	...	174	200
	Bunbury ...	30·070	30·111	30·490	29·720	68·6	49·5	59·0	77·0	36·5	73·8	53·2	89·5	37·3	260	301
	Busselton ...	...	...	...	...	68·7	47·4	58·0	77·0	32·0	...	...	...	...	199	251
	Bridgetown ...	...	...	...	...	67·7	43·7	55·7	82·9	32·0	...	...	...	...	305	356
	Karridale ...	30·010	30·116	30·410	29·570	67·0	50·0	58·5	79·0	36·0	71·0	52·1	92·0	36·8	426	586
	Cape Leeuwin ...	30·015	30·080	30·470	29·490	66·0	57·0	61·5	74·0	50·0	69·4	59·3	89·5	49·0	262	350
	Katanning ...	30·050	30·104	30·460	29·600	67·0	48·0	57·5	80·0	34·2	73·0	48·5	96·2	33·0	327	351
	Albany	30·056	30·106	30·479	29·517	65·4	51·1	58·2	75·8	42·6	69·3	52·8	98·8	39·5	531	671
	Breaksea... ...	30·050	30·106	30·490	29·510	63·2	54·0	58·6	76·0	48·0	66·9	56·4	96·4	44·0	372	485
	Esperance ...	30·035	30·128	30·470	29·570	69·1	52·9	61·0	85·2	40·2	72·8	54·5	99·0	40·2	194	366
	Balladonia ...	...	...	...	...	71·1	49·8	60·4	95·2	38·5	...	...	...	...	142	181
	Eyre*	30·028	30·126	30·520	29·764	71·8	56·7	64·2	98·8	46·5	74·0	54·9	100·7	36·8	246	365
						INTER-STATE.										
	Perth	30·060	30·104	30·477	29·719	71·0	54·7	62·4	85·7	44·2	75·6	56·7	97·4	42·4	216	238
	Adelaide	...	30·146	...	...	...	...	...	...	...	73·4	54·7	98·0	39·6	...	...
	Melbourne	30·024	30·025	30·280	29·561	67·0	51·3	59·2	88·5	44·5	68·6	50·6	94·0	34·8	376	...
	Sydney	30·070	30·107	30·440	29·732	72·0	59·0	65·5	86·0	51·0	70·8	58·2	88·9	44·6	173	...

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected except in the case of the Perth Botanical Gardens.

The Observatory, Perth,
7th May, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for March, 1903 (completed as far as possible), and for April, 1903 (principally from Telegraphic Reports).

Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham	950	12	287	8
6-Mile	...	...	...	...
The Stud Station	548	8	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs	...	...	...	...
Lisadell	663	4	...	...
Turkey Creek	765	9	432	11
Plympton, St. Mary	...	...	...	...
Koojubrin	...	...	...	...
Hall's Creek	616	10	470	...
Flora Valley	...	...	...	...
Ruby Creek	...	...	...	...
Denison Downs	250	...	...	...
West Kimberley:				
Obagama	...	...	...	...
Beagle Bay	...	...	...	...
Derby	128	5	842	10
Yeeda	...	...	...	...
Liveringa	...	...	...	...
Mt. Anderson	...	...	...	...
Leopold Downs	...	...	...	...
Fitzroy Crossing	76	6	108	...
Fitzroy (C. Blythe)	165	2	...	...
Quanbun	15	2	...	...
Nookanbah	25	3	...	...
Broome	601	...	625	6
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay	366	8	632	9
North-West:				
Wallal	143	3	422	4
Condon	197	1	475	4
DeGrey River	...	...	...	...
Port Hedland	595	3	50	3
Boodarie	...	...	...	...
Yule River	...	...	...	...
Warralong	182	2	...	...
Muccan	148	2	...	...
Ettrick	...	...	...	...
Mulgie	...	...	...	...
Eel Creek	...	...	...	...
Pilbarra	576	2	50	3
North-West—*cont.*				
Coongon	...	...	...	...
Warrawagine	...	...	...	...
Bamboo Creek	85	1	84	4
Marble Bar	51	1	145	7
Warrawoona	28	...	125	...
Corunna Downs	...	...	...	...
Nullagine	45	1	307	6
Yandicoogina	...	...	...	...
Kerdiadary	...	...	...	...
Roy Hill	...	...	...	...
Mosquito Creek	...	...	...	...
Mulga Downs	...	...	...	...
Woodstock	...	...	...	...
Mt. Florence	600	1	...	...
Tambrey	1167	3	...	...
Millstream	305	1	...	...
Yandyarra	...	...	...	...
Mallina	...	...	...	...
Whim Creek	1075	3	78	...
Cooyapooya	413	2	...	...
Woodbrooke	407	2	...	...
Croydon	1322	2	...	...
Balla Balla	455	2	Nil	...
Roebourne	423	3	27	1
Cossack	338	3	103	1
Fortescue	6	1	94	1
Mardie	7	1	...	...
Mt. Stewart	...	...	...	...
Yarraloola	103	2	...	...
Chinginarra	...	...	...	...
Onslow	Nil	...	1	1
Peedamullah	68	3	...	...
Red Hill	...	...	...	...
Mt. Mortimer	Nil	...	...	...
Wogoola	8	1	...	...
Nanutarra	34	1	...	...
Yanrey	...	...	...	...
Point Cloates	...	...	...	...
Gascoyne:				
Winning Pool	Nil	...	3	1
Towara	...	...	...	...
Ullawarra	...	...	...	...
Maroonah	...	...	...	...
Glifford Creek	...	...	...	...
Bangemall	...	...	...	...

RAINFALL—*continued.*

Stations.	March.		April.		Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.		No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Gascoyne—*contd.*					Gascoyne—*contd.*				
Mt. Augustus ...	...	...	...	...	Coodardy ...	20	1	...	...
Minnie Creek ...	2	1	...	...	Cue	14	1	27	2
Yanyeareddy ...	15	1	...	...	Day Dawn ...	Nil	...	15	2
Williambury ...	...	...	...	...	Lake Austin ...	Nil	...	5	2
Wandagee ...	...	...	...	...	Lennonville ...	Nil	...	4	2
Bernier Island ...	Nil	...	...	...	Mt. Magnet ...	7	1	10	1
Boolathana ...	Nil	...	...	...	Warracoothara ...	...	...	...	...
Carnarvon ...	Nil	...	42	2	Challa	Nil	...	22	1
Cooralya	...	...	...	...	Murrum	Nil	...	...	...
Doorawarrah ...	Nil	...	...	...	Burnabinnah ...	Nil	...	...	..
Mungarra ...	Nil	...	...	...	Barnong	Nil	...	...	...
Clifton Downs ...	...	...	...	...	Yalgoo	Nil	...	Nil	...
Dairy Creek ...	...	...	...	...	Gabyon	Nil	...	79	3
Upper Clifton Downs	Nil	...	...	...	Wuraga	Nil	...	...	...
					Gullewa	Nil	...	22	...
Errivilla	...	...	...	...					
Dirk Hartog Island	Nil	...	...	...	South-West Division (Northern Part):				
Sharks Bay ...	Nil	...	35	...					
Kararang ...	...	...	...	...					
Meedo	...	...	...	...	Murchison House	Nil	...	...	...
Tamala	Nil	...	...	...	Mt. View ...	Nil	...	...	...
Wooramel ...	Nil	...	132	...	Mumby	3	1	102	9
Hamelin Pool ...	Nil	...	59	2	Yuin	...	...	...	...
Byro	Nil	...	...	...	Northampton ...	Nil	...	108	5
Yarra Yarra ...	8	1	...	...	Mt. Erin ...	Nil	...	102	4
Berringarra ...	1	1	...	...	Oakabella ...	...	...	...	...
Mt. Gould ...	...	...	...	...	Narra Tarra ...	Nil	...	...	...
Wandary... ...	Nil	...	...	...	Tibradden ...	Nil	...	67	7
Peak Hill ...	29	1	117	2	Sand Springs ...	Nil	...	...	...
Horseshoe ...	28	1	...	...	Mullewa... ...	Nil	...	29	5
Mt. Fraser ...	...	...	...	...	Kockatea ...	Nil	...	25	3
Abbotts	Nil	...	120	3	Bootenal ...	...	...	...	..
Meekatharra ...	...	...	...	...	Geraldton ...	Nil	...	34	3
Belele	...	...	...	...	Greenough ...	Nil	...	30	3
Mileura	Nil	...	...	...	Dongara ...	Nil	...	114	7
Milly Milly ...	5	1	...	...	Dongara (Pearse)	Nil	...	76	6
Manfred ...	Nil	...	...	...	Strawberry ...	Nil	...	...	...
New Forest ...	...	...	...	...	Mingenew ...	1	1	40	6
Woogorong ...	Nil	...	...	...	Urella	Nil	...	50	6
Billabalong ...	...	...	...	...	Yandenooka ...	Nil	...	52	4
Wooleane ...	Nil	...	...	...	Rothesay ...	Nil	...	...	...
Murgoo	...	...	...	...	Carnamah ...	5	1	56	7
Meeka	Nil	...	...	...	Watheroo ...	3	2	...	...
Mt. Wittenoom ...	Nil	...	...	...	Dandaragan ...	13	2	88	8
Nannine	7	1	23	3	Moora	Nil	...	78	7
Star of the East...	5	1	85	3	Yatheroo ...	Nil	...	104	7
Annean	8	1	...	...	Walebing ...	8	1	140	10
Tuckanarra ...	28	1	30	3	New Norcia ...	8	2	117	7

RAINFALL—*continued.*

STATIONS.	MARCH.		APRIL.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	12	1	142	13
Belvoir	25	4	225	10
Mundaring ...	38	3	465	11
Guildford ...	23	5	255	14
Canning W't'r'w'ks	29	3	...	...
Perth Gardens ...	28	7	268	17
Perth Observatory	20	5	216	15
Subiaco	26	5	182	13
Claremont ...	23	5	...	...
Fremantle ...	36	7	314	14
Rottnest	13	8	315	14
Rockingham ...	35	4	232	14
·Canning River ...	13	3	...	...
Jarrahdale ...	27	3	336	10
Mandurah ...	24	6	275	12
Pinjarra	48	3	288	7
Yarloop	52	5	318	16
Harvey	24	4	...	...
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley ...	5	1	...	...
Momberkine ...	Nil	...	95	5,
Monglin ...	7	1	...	...
Culham	...	...	...	...
Newcastle ...	Nil	...	68	5
Eumalga ...	6	1	128	9
Northam ...	6	1	127	9
Grass Valley ...	5	1	189	7
Meckering ...	1	1	195	9
Cunderdin ...	...	...	...	...
Codg-Codgen ...	5	1	163	11
Jarragin... ...	3	1	90	7
Doongin... ...	Nil	...	193	7
Cuttenning ...	13	1	220	8
Whitehaven ...	8	3	...	...
Sunset Hills ...	8	1	...	...
Cobham	10	1	151	11
York	Nil	...	115	10
Beverley ...	2	2	110	7
Barrington ...	5	1	...	...
Stock Hill ...	Nil	...	196	10
Sunning Hill ...	Nil	...	285	11
Wandering ...	14	3	263	12
Pingelly ...	5	1	248	8
SOUTH-WEST—*contd.*				
Marradong ...	19	4	267	9
Bannister ...	23	4	...	...
Narrogin ...	10	2	282	12
Wickepin ...	10	4	...	...
Gillimaning ...	9	2	...	...
Bunking ...	32	3	533	7
Bullock Hills ...	21	3	...	...
SOUTH-WEST DIVISION (SOUTHERN PART):				
Bunbury ...	35	...	260	...
Collie	38	6	231	15
Salvation Army Settlement	32	4	...	...
Glen Mervyn ...	41	5	256	11
Dardanup ...	36	5	233	12
Donnybrook ...	23	3	174	10
Boyanup ...	26	3	199	11
Ferndale ...	42	3	236	10
Busselton ...	42	7	199	11
Lower Blackwood	85	8	340	12
Karridale ...	116	13	426	19
Cape Leeuwin ...	67	17	262	17
Biddellia ...	146	9	434	13
The Warren ...	183	9	577	16
Lake Muir ...	99	8	414	17
Mordalup ...	79	9	...	...
Deeside	89	10	360	18
Riverside ...	89	9	...	...
Balbarup ...	86	7	372	15
Wilgarup ...	100	6	...	...
Mandalup ...	38	5	...	...
Bridgetown ...	43	6	305	18
Westbourne ...	69	8	...	...
Greenbushes ...	45	5	212	8
Greenfields ...	31	4	186	11
Glenorchy ...	20	3	...	...
Williams ...	20	5	281	11
Arthur	11	1	316	8
Darkan	6	1	...	...
Wagin	15	3	375	9
Glencoe ...	16	3	376	12
Dyliabing ...	19	4	305	11
Katanning ...	13	3	327	...
Kojonup ...	52	5	504	12
Broomehill ...	20	4	286	10
Sunnyside ...	29	5	291	13
Woodyarrup ...	12	2	310	14

RAINFALL—*continued.*

Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West—*contd.*				
Cranbrook ...	30	2	290	10
Blackwattle ...	49	6	...	...
Mt. Barker ...	108	10	394	17
Kendenup ...	44	6	265	14
St. Werburgh's...	89	11	...	...
Forest Hill ...	150	14	505	21
Denmark ...	192	8	...	...
Grasmere ...	154	12	600	16
Albany	114	14	531	19
Point King ...	98	9	536	16
Breaksea ...	83	15	372	20
Wattle Hill ...	207	12	...	...
Cape Riche ...	95	3	...	...
Pallinup ...	19	6	295	12
Bremer Bay ...	98	6	160	12
Jarramongup ...	17	4	...	...
Eastern Division:				
Lake Way ...	Nil	...	39	4
Gum Creek ...	Nil	..	...	...
Mt. Sir Samuel...	30	2	126	6
Lawlers	32	1	97	4
Leinster G.M. ...	10	1	...	...
Mt. Leonora ...	37	2	77	5
Mt. Malcolm ...	43	2	46	4
Mt. Morgans ...	120	2	50	4
Burtville ...	146	1	...	...
Laverton ...	265	...	53	5
Murrin Murrin...	33	2	77	4
The Granites ..	43	2	117	...
Tampa	89	1	58	3
Kookynie ...	60	1	141	3
Niagara	Nil	...	97	3
Yerilla	Nil	...	138	3
Edjudina ...	76	1	...	...
Menzies	66	...	127	4
Mulline	30	1	76	3
Waverley ...	Nil	...	208	5
Goongarrie ...	40	1	121	3
Mulwarrie ...	5	1	173	4
Kurawa	9	1	179	6
Kurnalpi ...	73	3	69	6
Bulong	Nil	...	103	6
Kanowna ...	8	1	113	3
Kalgoorlie ...	7	1	171	5

Stations.	March.		April.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Eastern—*contd.*				
Coolgardie ...	Nil	...	103	3
Burbanks P.O. ...	Nil	...	165	5
Burbanks Birthday Gift	...	...	...	...
Woolubar ...	...	...	...	...
Widgiemooltha...	Nil	...	102	6
50-Mile Tank ...	Nil	...	181	6
Waterdale ...	...	...	...	...
Norseman ...	Nil	...	244	8
Bulla Bulling ...	Nil	...	131	5
Woolgangie ...	Nil	...	107	5
Boorabbin ...	Nil	...	84	5
Karalee	5	1	120	4
Yellowdine ...	Nil	...	78	5
Southern Cross...	Nil	...	113	7
Mt. Jackson ...	Nil	...	...	...
Bodallin ...	Nil	...	...	...
Burracoppin ...	...	...	...	...
Kellerberrin ...	7	1	174	7
Mangowine ...	Nil	...	134	7
Wattoning ...	Nil	...	...	...
Eucla Division:				
Ravensthorpe ...	27	6	157	12
Coconarup ...	14	5	204	10
Hopetoun ...	69	6	153	9
Fanny's Cove ...	79	4	...	...
Park Farm ...	119	8	166	13
Esperance ...	123	7	194	17
Gibson's Soak ...	93	8	...	...
30-Mile Condenser	62	7	...	...
Swan Lagoon ...	22	7	...	...
Grass Patch ...	22	7	...	...
Myrup	144	6	...	...
Lynburn ...	147	4	180	13
Boyatup... ...	94	4	...	...
Point Malcolm ...	63	4	164	18
Israelite Bay ...	10	3	83	12
Bulbinia... ...	...	...	...	...
Frazer Range ...	Nil	...	...	...
Balladonia ...	Nil	...	142	10
Southern Hills ...	Nil	...	...	...
Eyre	101	4	246	16
Mundrabillia ...	100	4	...	...
Eucla	84	5	373	17

The Observatory, Perth,
6th May, 1903.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during April, 1903.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of														
					Apples.	Apricots.	Bananas.	Quinces.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomeloes.	Pines.	All other fruits.
Fremantle ...	7536	6365½	1170½	1170½	1727½	...	47	46	...	792	...	1259	...	1762	732	...	...	...	...
Albany	1	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Geraldton ...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...
Esperance ...	12	12	...	...	6	...	...	1	...	...	...	...	...	3	2	...	...	...	...
Total ...	7551	6380½	1170½	1170½	1733½	...	47	47	...	793	...	1259	...	1765	734	...	2	...	...

Department of Agriculture,
8th May, 1903.

Return of Fruit Trees and Plants imported into Western Australia during April, 1903.

NAME OF PORT.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.														
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
FREMANTLE ...	3	4100	3	4100	...	..	...	4100	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
ALBANY ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
GERALDTON ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
ESPERANCE ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL ...	3	4100	3	4100	...	...	...	4100	...	...	.	...	...	...	...	...	...	...	...	...	...	...	...

Department of Agriculture,
8th May, 1903.

By Authority: WM. ALFRED WATSON, Government Printer, Perth.

NOTES.

Introduction of Parasite.—In this issue an interesting letter is published from the Government Entomologist, Mr. G. Compere, who is travelling through Europe searching for parasites to our garden and farm insect pests. Accompanying the letter were a number of parasites, including scale and aphis-eating insects, which have been liberated.

Journal of Victoria.—We are pleased to note the re-issuing of the *Journal of Agriculture* of Victoria. Part I. of Vol. II. came to hand by the last mail. This journal ranks as one of the best published. The information contained in its pages are most valuable, and the plates are not only works of the printer's art, but are so descriptive in themselves as to make them very instructive. We trust that it will continue its useful career.

A "White Drink."—For horses fagged out after a tiring journey there is no safer or better tonic than a "white drink," made by stirring a pint of oatmeal in a pail of water off which the chill has been taken. White drinks of this kind are not only good thirst quenchers, but they also seem to act as restoratives, and are found very effective in enabling animals to regain the "tonicity" of constitution lost either through illness or through undergoing severe exertion.

Elephant Ploughing.—Ploughing with bullocks is very common in India, but the elephant at the plough is quite a novelty. In the Punjab there was some land which required deep ploughing, and the manager thought an elephant would be better able to endure the toil than a team of bullocks. He was yoked to a Bedford plough, and, after some training, the elephant soon got used to the work. This interesting and practical experiment took place at the military grass farm at Umballa, under the direction of Mr. R. H. Ewart.

Raisin Growing.—The returns are to hand of last season's raisin crop of California, showing a considerable increase on previous years. The output for the season amounted to 85,177,864lbs. A very large industry has sprung up in regard to seeding raisins for market. It is about time that our local growers made some show in this particular line. So far as climatic conditions are concerned, this State is, if anything, a more favoured one than

California. We have seen some muscats that were grown at Cannington and dried in the sun without any special care or treatment, that bore favourable comparison with those imported.

EXPERIMENTAL FARMING.—In this progressive age every farmer must needs be an experimentalist. The one who studies the nature of the soil and, by the proper use of fertilisers, often increases his yield by 20, 30, or even 50 per cent. Mr. J. Davidson, in the *Journal of Agriculture* of South Australia, says:—"To be thoroughly progressive, both as regards stock-breeding and crop-raising, every farmer should be an experimentalist. Portions of his land should be set apart for trying the qualities of fertilisers and their effect on various kinds of crops, and ascertaining the most suitable fodders, etc., for his particular locality and nature of soil, which would prove a most valuable source of gaining exact knowledge for himself. Nothing could possibly take the place of such experiments."

HAULING POWER.—The hauling power of a draught horse and mule has been variously estimated. Mr. Henry, in his interesting book on "Feeds and Feeding," says:—Remie found the hauling power of a horse weighing 1,200lbs. equal to about 100lbs. at 2·5 miles an hour for eight hours a day, or a 20-mile haul. This is a little over two-thirds of a Watt horse-power, and is ordinarily taken to be five times the power of a man. Between 2·5 and four miles an hour, the hauling power of the horse is nearly inversely as the speed. The mule carries a load of 200lbs. to 400lbs., and its day's work consists, usually, in the transportation of the equivalent of 5,000lbs. to 6,000lbs. per mile. The ass carries 175lbs. and upwards, and its day's work is the equivalent of 3,000lbs. to 4,000lbs. per mile. Weisbach was of opinion that "the pulling power of a draught horse is said to be, as a rule, about one-fifth of its weight." One hundred pounds is a common pull for the average horse in draught vehicles.

FRUIT SEEDS AND APPENDICITIS.—The *Dietetic and Hygienic Gazette* says:—"Many very intelligent people are deterred from swallowing the seeds of berries, grapes, and other fruits, lest the lodgement of these small bits of indigestibleness may induce that dreaded accident, appendicitis. This fear is utterly baseless, since the healthy appendix is protected by a valvular arrangement which prevents even the smallest seeds from entering it. It is only after inflammation has already destroyed its normal protection that any foreign substance can gain access to it. To feel compelled to eschew all seedy berries and fruits is to seriously curtail one's dietary, and it is entirely unnecessary. In fact, the free and constant use of ripe berries and fruits of all kinds is one of the best preventives of this dangerous disease. Fruit-eating prevents or helps to overcome constipation, and constipation is the most prolific cause of appendicitis. The physician should thoroughly disabuse his patients of this mistaken notion. All the smooth seeds are harmless."

Spray for Vegetables.—The following is taken from the *Queensland Agricultural Journal* as being an infallible wash for destroying aphis and other insect life on vegetables:—"The trouble with paris green is that it will not stick to the glossy leaves of cabbages and cauliflowers, but collects at the base of the stalk and at the junction of the stalk and leaves. Sprays are open to the same objection. The following wash, however, will stick like varnish, and in an instant destroy all animal life on the plants:—Take 20 lbs. of resin, 4 lbs. of caustic soda (98°/o) or 6 lbs (70°/o), three pints of fish oil or two and a-half lbs. of whale oil soap, and 140 to 150 gallons of water; place all the above ingredients in a boiler with 20 gallons of water, and let the whole simmer for three hours; then add *hot* water slowly, and stir till there are at least 40 gallons of solution; then add *cold* water to make to 140 gallons. Never add *cold* water when cooking. This wash, using only 80 gallons of water, will destroy the mussel, glover, and white scales on citrus trees, and the mussel scale of the apple."

Pea or Earth Nuts.—As there appears likely to be a demand in Sydney (says the *Queensland Journal*) for earth nuts, for the purpose of oil-making, we should be glad to know of any being grown in quantities in this State. Earth nuts succeed splendidly here, wherever they have been grown. Some time ago a farmer in the South grew a considerable quantity, but had great difficulty in disposing of them, the only buyers being Chinamen, who send them for manufacture to China. From data given by one grower to a gentleman in Brisbane, it would seem that the return of his crop was equal to £35 per acre. At 2d. a pound, this would mean nearly two tons per acre. No doubt earth nuts are very prolific, and, when the main crop is gathered, large quantities are left in the ground. These make good pig-feed, and by setting up a rolling fence, to confine the pigs to a small area at a time, the animals would root about and pick up every nut on the field. We have had some inquiry from Sydney as to whether they are procurable in quantities here, but nothing was said about how much was required, or what price would be given. [We have often urged, through the *Journal*, the advisability of trying this crop in Western Australia.—Ed. *Journal*.]

A Substitute for Dishorning.—We publish the following at the request of a correspondent. The method mentioned has, on several occasions, been advocated in this *Journal*:—"Leaflet No. 81, issued by the Board of Agriculture, London, says: It is well known that polled or dishorned cattle can be managed and fattened with greater facility than horned animals, and that where a consignment consists solely of hornless cattle the animals can be conveyed by sea or land with less danger of sustaining injury while in transit. The opinion of Irish salesmen and feeders of experience in the cattle trade, who were consulted by the Department of Agriculture and Technical Instruction for Ireland, is to the effect that Irish stores for export, when horned, require more space in railway waggons, on board ships, and in the market place; that they receive more injury in transit; and that they are worth from 10s. to 15s. per head less than hornless cattle. The practice of dishorning cattle by sawing off or otherwise entirely removing the horns after they are partly or fully grown appears to inflict great pain upon the animals, and may even be the cause of death; and the board, therefore, desire to call the attention of breeders and stockowners to a method of preventing the growth of the horns by the application of caustic potash to the horn-bud of young calves. If performed in the manner set out below, and with proper regard to the precautions which follow, the operation is comparatively painless, and can be done quickly and with ease:—Clip the hair from the top of the horn when the calf is from two to five days old. Slightly moisten the end of a stick of caustic potash with water or saliva (or moisten the top of the horn-bud), and rub the tip of each horn firmly with the potash for about a quarter of a minute, or until a slight impression has been made on the centre of the horn. The horns should be treated in this way from two to four times, at intervals of five minutes. If, during the interval of five minutes after one or more applications, a little blood appears in the centre of the horn, it will then only be necessary to give another very slight rubbing with the potash. The following directions should be carefully observed:—The operation is best performed when the calf is under five days old, and should not be attempted after the ninth day. Caustic potash can be obtained from any chemist in the form of a white stick. When not in use it should be kept in a stoppered glass bottle in a dry place, as it rapidly deteriorates when exposed to the air. One man should hold the calf while an assistant uses the caustic. Roll a piece of tinfoil or brown paper round the end of the stick of caustic potash, which is held by the fingers, so as not to injure the hand of the operator. Do not moisten the stick too much, or the caustic may spread to the skin around the horn and destroy the flesh. For the same reason, keep the calf from getting wet for some days after the operation. Be careful to rub on the centre of the horn, and not round the side of it. Note.—Caustic potash is poisonous, and must, therefore, be kept in a safe place."

ERGOTISM.—Kansas Experiment Station: Ergotism is a disease of animals caused by eating ergot either on pasture grasses or hay. Ergot is a parasitic fungus (*Claviceps purpura*) that develops on the heads of wild rye, redtop, and similar grasses.

This fungus replaces the ordinary seed or grain with a black or brown-black grain much longer than the ordinary rye grain, cylindrical, pointed, and slightly curved. The number of grains of ergot in a single head of rye or grass will vary from one to a dozen, or more. The grains of ergot can be easily recognised by their shape and colour. There is no dust or smut upon the heads of grain as there is with some fungi. Ergot does not attack corn or sorghum. Outbreaks of ergotism occur nearly all over the world, and often cause heavy losses among cattle and horses. Serious losses from ergot in this State have not occurred since 1884, but it is possible that, owing to the abundance of ergot upon grasses the present season, serious loss may follow unless care is exercised to prevent feeding a large amount of ergot. Cold weather and a limited supply of drinking water seem to favour the development of ergotism. *Symptoms.*—The symptoms of ergotism may occur at once after eating the fungus provided the animal gets a sufficient quantity, or they may occur only after the animal has eaten the fungus for some time. Ergot lessens the blood supply, especially in the extremeties—feet, tail, and ears—the affected parts swell, get cold; a well defined line usually forms about the part, below which the tissue dies and sloughs off. When the feet are attacked the animal becomes very lame. Ergot causes abortion in pregnant animals; but this must not be confounded with contagious abortion among cattle. Ergot also affects the nervous system, causing trembling of the muscles, weakness, staggering gait, and sometimes convulsions. The digestive system is often affected, and there may be purging, indigestion, and abdominal pain. Cattle are more seriously affected by ergot than horses. *Treatment.*—To prevent the disease, do not feed animals on hay or grass containing ergot, and when the disease occurs ergot should be withheld at once. A purge of one pound of epsom salts for adult cattle, or a quart of raw linseed oil for horses, should be given. Give sloppy, nutritious foods, with plenty of drinking water. Bathe affected parts, feet, etc., with hot water, rubbing to stimulate circulation, and apply antiseptics, such as a 5 per cent. solution of carbolic acid.

OUR ENTOMOLOGIST.—Just as we go to press, we learn that Mr. Compere has returned to this State, bringing with him a great number of various parasites, which will be liberated as soon as possible. Amongst the more important discoveries are several species of the parasite of the codlin moth. A description of the insects, together with a full report from Mr. Compere, will appear in our next issue.

OUR LAND—THE SOURCE OF ALL WEALTH

By J. H. Wilbur.

The following is a report of one of a series of lectures now being delivered by Mr. J. H. Wilbur:—

The land is the source of all wealth; from the soil we obtain the kindly fruits of the earth; the grains, the vegetables; upon its surface graze the flocks and herds which contribute so much towards supplying our physical wants. From the soil, directly and indirectly, we derive our supplies of silk, cotton, flax, and hemp, which furnish us with clothing and many other articles that come into daily use. From the bowels of the earth we draw our supplies of precious and other metals—the iron and coal which are so necessary to our modern complex civilisation. There may be those present who might ask, What about the ocean? If it were not for the timber, if it were not for the cotton and hemp, if it were not for the iron and coal, no ships nor boats would plow the oceans' depths. Indeed, without the product of the soil in the shape of fibrous plants, we would have no fishing lines nor nets, so that it is true that primarily all wealth comes from the soil. This being a fact, it necessarily follows that in countries where the natural resources are most highly developed there the greatest wealth is to be found. For example, look at France. At the end of the French revolution, about a century ago, France was one of the most impoverished nations in Europe; at that time the estates of the nobles were confiscated, and where large tracts were unoccupied and almost uninhabited, in a short time they were filled with orchards, vineyards, gardens, and farms; these again, under the laws of France, were subdivided on the deaths of the owners among their children, and at the present day France is filled with small farms and holdings, and its people, as a whole, are the richest on the face of the globe. As a proof of this, at the close of the great Franco-German war in 1870, Bismarck demanded a war indemnity to be paid in gold. To his astonishment and that of the financiers, the money was promptly raised among her own people; the peasantry, the farmers, the vignerons brought in their hoards, and, without any financial disturbance of the districts, the demands of the conqueror were met. Not only that, but in a comparatively few years after, over two hundred millions sterling—money of the French people—was spent by De Lesseps in his Panama Canal scheme. Only a year or two ago, Paris advertised for a loan of about three millions sterling, at 2½ per cent. The loan was over-subscribed in small amounts by the people, the citizens of France. The United States, which is forging ahead at a marvellous rate, within the last 40 years obtained its great wealth from its yearly supplies of wheat, cotton, tobacco, beef, and pork, and other products. At this very moment their annual exports exceed their imports by hundreds of millions. They have not only millionaires, but multi-millionaires in that country, and at the present rate they will in time control the money power of the world. Now let us look to our own land. What are its capabilities? Can it support a large population? Can it produce enough to sustain a large population? Most emphatically, yes. This State contains an area of nearly 1,000,000 square miles, or over 624,000,000 acres. Of this amount, only about 10,000,000 have been alienated, or are in process of alienation from the Crown. In the North there are magnificent pastoral lands, where roam flocks and herds of sheep and cattle. And here let me say that at a late wool sale in London a parcel of Western Australian wool topped the market. In the South there are immense areas of pastoral lands; and beyond, in that vast extent of country—at present virtually unknown—stretching from the Eastern Goldfields to the Eastern borders of the State, there may be, for all we know, immense tracts of pastoral lands. A large number of leases have been granted, and there are still hundreds of millions of acres open for leasehold for pastoral purposes. These lands may be obtained at an annual rental of from 10s. to 20s. per 1,000 acres. Along the Western shore line, stretching from the vicinity of Geraldton in the North to Albany on the Southern coast, and thence Easterly, there is a strip of land as far as Esperance, known as the South-Western Division of the State; and here are located the greater portion of the agricultural lands. It comprises within its limits nearly 50,000,000 of acres, and it is estimated that there are still 10,000,000 of acres of first-class agricultural land open for selection. To give an idea as to the rapidity with which the public lands are disposed of, I will point out for your information that during the first four months of this year 1,175 applications, covering nearly 300,000 acres of conditional purchase land, have been approved of by the Minister for Lands. The climate within the South-Western district, tempered by the South-Western breezes of the Indian and Southern Oceans, is, without question, the finest on the face of the globe. The rainfall through the greater portion of the area averages 35 to 15 inches per annum. The nearer the coast the heavier the rainfall. Over a large portion of the territory crops can be grown without irrigation, and in many districts there are rivers where it is possible to conserve water to a sufficient amount to supply whatever artificial need may be necessary. Now, the question may be asked, "Where will the market come from?" The best way to answer that question is to show what we are doing at present in the way of supplying our people with food. Last year we had a total of over 85,000 acres under wheat. The yield amounted to 882,000, or an average of 10⅓ bushels per acre. Now I suppose you have often heard it said that there was no good land in Western Australia; that the State could never supply its own people; yet here is a fact that cannot be controverted. The average of wheat per acre here is more than that of any other of the States for a term of years. In Western Australia we imported last year 85,240 bushels of wheat and 13,577 tons of flour. Now, if we add the amount grown to the wheat and flour imported, expressing the latter in its equivalent in wheat, it will be found that the total amounts to 1,646,110 bushels; in other words, we raised but little more than one-half of the quantity required. To put it in another shape, the average consumption of flour per head of population amounts to 300lbs. annually. A bushel of wheat equals 40lbs. flour, therefore, we consume 7½ bushels of wheat for every inhabitant during the year. In addition to that, one bushel and a half per inhabitant is required for seed and other purposes, making a total of nine bushels, equivalent to the product of nine-tenths of an acre. Estimating our population now at 220,000, we should have at least 200,000 acres under wheat this year, and with a rapid increase of population by excess of births over deaths and of immigration over emigration, the amount should not be less than 225,000 acres to carry us through, with our own production, in the coming season. During the year 1902 we imported 12,000 tons of potatoes, or, taking an average of three tons to the acre—a very small one—we should have had 4,000 acres more under that crop last year. We imported one thousand seven hundred (1,700) tons of hams and bacon, which means, estimating the weight of pigs at 175lbs. each, it would require a drove of 20,000 more to be produced in the State to meet our requirements. We imported 2,850 tons of butter and 550 tons of cheese. Estimating that the average dairy cow will produce 100lbs. of butter during the 12 months, it will require an addition to our dairying stock of at least 58,000 head of cows to supply us with those articles, to say nothing of milk. We imported 1,500 tons of salted and preserved meats, 8,850 head of cattle, and 62,000 sheep for slaughter, and during the year we imported eggs to the value of £71,000 sterling. These articles cost at the ports of shipment over £1,000,000 sterling, but this does not represent the cost to the consumer, as commissions, insurances, freight, duty, and the profits of the middleman would probably bring the price to the consumer up to at least one and a-half million. In addition to this, we imported an immense quantity of preserved milk, preserved foods, jams and jellies, dried fruits and raisins, which should be grown within our own borders. We have to supply not only the goldfields but the coastal cities also, and the question may be asked: What can be done with the surplus after our own market is supplied? We have the markets of the world open for us. I do not hesitate to say that we have one of the finest and best fruit-producing countries in the world. We are four days nearer Europe than any other port in Australia, and it is only a question of a short time when the steamers plying between here and Great Britain will provide not only frozen chambers for meats and butter, but also cold storage for fruit. The temperature will be kept one or two degrees above the freezing point by the introduction of cold sterilised air, and there will not be the slightest difficulty in landing oranges, lemons, mandarins, apples, and pears in good condition in the European markets. I also believe that it will be a comparatively easy matter to send grapes of the more fleshy varieties, such as the Dorodillas and the Black Hambro, peaches, apricots, and plums; and our market will not be confined to Great Britain, but we will have all the great markets of Europe calling for our products. Possessing the advantages which Western Australia does in the way of soil and climate, with ready markets for our produce at our own doors, this State should support within its borders millions of our race. Our Government, recognising this, are doing all within their power to place the people upon the land. Our land laws are more liberal than those in any other part of the English-speaking world. Any head of a family, or male 18 years of age or over, can become the owner of 160 acres of land under the free homestead section of the Land Act. The applicant is required to swear that he does not own already more than 100 acres of land, and, with the application, is required to pay the sum of 20s. as a proof of his *bona fides*. He is required to live upon the selection at least six months in every year during the first five years. This gives him ample time to fulfil the improvement conditions, and at the same time earn enough outside to sustain himself. This residence clause may be waived under certain circumstances by the Minister, but in that event twice the amount must be spent in improvements. The improvement conditions are: First, that the selector must within two years erect a habitable house, costing not less than £30, or he must expend £30 in clearing or plant two acres with fruit trees or vines. Within five (5) years one-quarter of the land must be fenced and one-eighth cropped. At the expiration of seven (7) years the entire exterior lines must be fenced and one-quarter placed under crop. In lieu of the crop conditions to cover certain cases, say, where the land is very heavily timbered, if the selector expends 30s. per acre on one-quarter of the acreage of his land within five (5) years and 60s. per acre within seven (7) years, that would be considered as an equivalent. Upon the fulfilment of the conditions a Crown grant will be issued at the expense of the selector. Should he desire to obtain a title sooner, he may do so after residing upon the property for 12 months and making the necessary improvements; upon payment of five (5) shillings per acre he will receive a title to the land. Land taken up under this section can only be mortgaged to the Agricultural Bank, and can only be transferred with the consent of the Minister for Lands, the object of that provision being to prevent the public lands getting into the hands of speculators.

Conditional purchase lands with residence are sold nominally at ten shillings per acre, but in reality at a yearly rental of 6d. per acre, spread over a term of 20 years, this being equal to 5 per cent. interest on the purchase money; and after paying that interest for 20 years, and fulfilling the improvement condition, the selector becomes entitled to the Crown grant.

The Residence conditions are that he shall reside upon the property for six months during each of the first five years; however, if he already be owner of a holding within 20 miles, residence upon either one counts for both. He may select from 100 acres to 1,000, and will be required to pay a half-year's rental in advance with the application. For instance, if he applies for 1,000 acres, he pays £12 10s. in advance, and then that same amount half-yearly for the full term of 20 years. The improvement conditions are that within two (2) years one-tenth of the selection must be fenced, and the whole of it within five (5) years; within 10 years improvements must be placed upon the property to the value of ten (10s.) shillings per acre, including one-half the cost of the exterior fencing, providing it is sheep and cattle proof; should the exterior fence be rabbit-proof, then two-thirds of the cost shall count as improvement.

Conditional payment lands, without residence, may be acquired in just the same manner, except that double the amount of the improvements are required, or at the rate of 20s. per acre.

Conditional direct purchase lands are sold in blocks of from 100 to 1,000 acres, at ten shillings (10s.) per acre, one-tenth to be paid on application and the balance within one year, in four quarterly instalments. The improvement conditions are that the whole block shall be fenced within three years, and within 10 years improvements must be effected upon the property to the value of five shillings (5s.) per acre, exclusive of exterior fencing.

Small areas for orchards, vineyards, or for garden purposes may be selected in blocks of from five to 50 acres, at a cost of 20s. per acre, one-tenth to be paid on application and the balance by six half-yearly instalments within three years. The property must be fenced and one-tenth planted with fruit trees or vines, or it could be used as a *bonâ fide* vegetable garden.

Grazing areas are divided into second and third class lands. Second class are sold at from 6s. 3d. to 10s. per acre, payable half-yearly, over a term of thirty (30) years. Third-class lands are sold at from 3s. 9d. to 6s. 3d. per acre, with payments extending over the same period. The conditions are that either the owner, his agent, or servant shall live upon the property for six months during the first year and nine months during the next four years. He shall pay one-half the cost of survey in ten half-yearly payments; shall fence one-tenth within two years and the balance within five years, and within fifteen (15) years shall expend upon improvements an amount equal to the purchase money, provided that half value of sheep and cattle proof exterior fencing, or rabbit proof fencing may be allowed. The maximum amount that can be selected is 3,000 acres of second-class land or 5,000 acres of third-class land, the minimum in both cases being 1,000 acres. Should, however, the land adjoin the holding of the applicant, a minimum of 300 acres is permitted. I here wish to say that, where selections are made on unsurveyed lands under any clause of the Act, the residential improvements date from the time of the completion of the surveys, and not from the time of the application.

REPURCHASED ESTATES.

We now come to the repurchased estates. In various parts of this State, sometimes in centres of population, near schools and railways, there are large estates which were granted by the Crown many years ago, and have been used principally for sheep and cattle runs. Many of these estates have been purchased by the Government under the Act of 1896, and, after classification, have been subdivided into areas, which have been offered for sale at from a few shillings to 40s. per acre. On the blocks where improvements have been effected in the shape of dwellings, fencing, or other additions to the land, etc., the value has been added to the cost price. These lands have been sold on payments extending over twenty (20) years. This works out so that for every £100 the purchaser is required to pay £7 12s. 10d. annually for a period of 20 years, when he becomes entitled to the Crown grant. The conditions are: One-tenth to be fenced in two years, the balance in five years, and within 10 years improvements to be effected equal to the purchase cost of the property, exclusive, however, of the value of the improvements on the property at the time of purchase. Residence is required for six months of each of the first five years, and no transfer permitted for two years. Under this Act close settlement has been induced; villages are springing up where but a few years ago sheep and cattle were the only living creatures known. Several of these estates are now open for selection, while others are being classified and surveyed. The eagerness with which these estates are being taken up shows the wisdom of the Government in introducing the Re-purchase of Lands Act in 1896.

The Agricultural Bank, instituted eight years ago, has proved a great benefit to selectors. Under its provisions, those upon the land, after certain improvements have been effected enough to prove their *bona fides* and to provide some security for the money asked for, may obtain loans ranging from £50 to £1,000, the interest being fixed at the rate of five (5) per cent. per annum. After a period of five years, the borrower begins to repay the loan at the rate of four (4) per cent. per annum, and at the expiration of 30 years the entire debt, principal and interest, is wiped out; but should a borrower desire at any time during the currency of the loan to pay off a part or the lot and save the interest, he is at full liberty to do so. When seeking a loan, the selector makes out an application on a prescribed form, in which he sets forth the value of his land, the improvements and their value, and then describes for what purpose the loan is required. For instance, he may wish to purchase agricultural implements, seeds, manures, stock, or pay for clearing or fencing. If, after examination by the inspector, the application is approved, the money is then advanced by the bank, and can only be used for the purpose for which it was applied for. Money can also be acquired from the bank for the purpose of paying off liabilities. For instance, there may be a mortgage already on the property drawing a high rate of interest; the Bank will advance the money to raise that mortgage, but, at the same time, the borrower must apply for one-third more money than is actually required to remove the mortgage, and that one-third must be placed in improvements on the property. The Bank has been in existence for a number of years, and so well has it been managed in the interests of the people and the State, that, so far, no losses have been incurred, and so popular is the Bank that already during the present current year applications have been received for over £70,000.

The Agricultural Department, with its experts, will at any time give advice free to settlers as to what sorts of grain and other crops will do best in particular localities; will instruct as to what varieties of fruit trees and vines should be planted; will instruct settlers in the way to prune and care for their trees and vines, and will do everything in their power to assist those who go upon the land. In addition to this, they have experimental plots and farms, where different seeds and plants are experimented with, and furnishing an object lesson to the farmer, orchardist, and vigneron; further, the results of these experiments are published, and the information dissiminated broadcast throughout the State. Again, the farmer is protected against fraud and imposition in the purchase of chemically-prepared manures, the law requiring that every invoice shall be carefully examined, and every shipment brought into the State be analysed, and, failing to contain a certain percentage of phosphates, it will not be allowed to be sold in the State. I am sure that in the foregoing I have made it clear that ours is a truly paternal Government; that it is doing all within its power to stimulate and increase production in all directions, and thus make our country self-supporting and independent of the world. I am sure that there are those in this audience who would like to ask the question, What will it cost to get upon the land? That is a most difficult question to answer. One man may go upon the land with one hundred pounds (£100), and squander it needlessly and extravagantly: it takes brains as well as muscle in these latter days to succeed in agronomic pursuits. Let me illustrate: Eight (8) years ago a man with his wife and two children went upon the land with barely enough money to purchase supplies for six (6) months, and when he commenced the work of clearing, his cash capital consisted of ninepence (9d.). He worked upon his own property until his provisions were exhausted, and then worked for one of his neighbours until enough was secured to buy another stock of provisions. The following spring one of his neighbours ploughed the little land which he had cleared; he put in a crop of wheat; it was harvested with the assistance of his neighbours; the chaff was taken to the station, he loaded it upon the trucks himself, went with it to Kalgoorlie, and there, without the intervention of the middleman, sold it to good advantage, and with the money obtained for it he bought his first pair of horses and a trap; and now, after a lapse of but eight (8) years, he owns a a farm of 1,000 acres, and this last season he had 500 acres under crop, and to-day he is independent of the world. In another case, two men with about £100 between them, and determination and muscle, worked together for three or four years, when one bought the other out. The fortunate purchaser sold his crop this last season for over £4,000. Another case can be cited of a man this last season selling his crop of 100 acres of hay as it stood in the field for £700 cash. I can tell you of the profits made by fruitgrowers; they seem almost fabulous. Then the opportunities for a dairying man are unsurpassed in any other part of Australia; poultry farming also being an enterprise which requires but small capital, pays handsomely where attended to properly. There is a man near Albany who is making a profit of between £250 and £300 a year out of this industry. Another, near Bunbury, is doing equally well. As I pointed out before, our imports of eggs are simply astounding. In order to supply our needs in eggs it would take at least three-quarters of a million more than we have available in the State at the present time. Taking it all round, the chances for a man to make a competency are unequalled anywhere.

Report on Cereals grown at Hamel, South-Western Railway, Season 1902-1903.

By G. F. Berthoud.

PART II.

Lowland Plots.

The soil consists of light brown loam, with subsoil of yellowish clay. The land was first ploughed during the early summer, and re-ploughed late in autumn. The sowing, owing to unavoidable delay, was continued very late in the season. The July sown plots did not get a fair show, owing to the excess of moisture in the early spring, which retarded the young growth. The quantity of seed and manure used per acre are the same as in the home plots, except the latest sown plots which I top-dressed on 27th October with nitrate of soda, at the rate of half hundredweight per acre. This I found improved the growth very much. The nitrate is also very beneficial for top-dressing potatoes and other crops, including orange trees when the fruit is setting. This fertiliser is very soluble, and the good effects may be seen in a few days on grain crops. It should be used carefully on garden crops in small doses during the growing season.

Wheat.

Tardent's Blue.—Sown 23rd May; growth strong, even, and healthy; height five feet six inches, level; straw good, stands up well; ripe 16th December; ears four and a-half inches long, well filled; yield at the rate of: grain 32 bushels, straw two and a-half tons per acre. Good and reliable variety.

Australian King.—Sown 24th May; growth healthy and fine; height four feet; straw good, stands up nicely; ripe 13th December; ears four inches long, thin and pointed; grain good; yield at the rate of: grain 19½ bushels, straw one and a-half tons per acre. Fair variety.

Brodie's Prolific.—Sown 25th May; growth good; habit low down when young; foliage bluish green; height five feet; healthy and fine; fair straw; ripe 10th December; ears three and a-half inches, rather pointed shape; chaff pale brown, few short awns on tips; yield at the rate of: grain 29 bushels, straw one and a-half tons per acre. Grain yellow and plump.

Queen's Jubilee.—Sown 27th May; growth upright and vigorous; foliage pale green, clean and healthy; height four feet six inches; straw of fair quality; ripe 3rd December; ears three and a-half inches long, large and well filled; grain good, shells easily when fully ripe; yield at the rate of: grain 30 bushels, straw one and a-half tons per acre. *Note.*—A plot of this wheat sown on 10th July gave returns almost equally good.

Field Marshall.—Sown 28th May; growth slow, fairly even; habit when young low and creeping; foliage narrow dark green, clean and healthy; height rather uneven and patchy; straw good, stands up nicely; ripe 17th December; ears three and a-half inches in length, thin and pointed; chaff white; few stiff awns on tips; holds grain well; yield at the rate of: grain 22½ bushels, straw one and a-half tons per acre. Grain yellow and good.

Ranjit.—Sown 29th May; growth upright, fine, and vigorous; foliage medium width, colour pale blue green, healthy, and clean; height four feet nine inches, level; straw slim and weak, falls about badly (not a suitable variety for culture here, should prove to be a good kind for the drier districts); ripe 1st December; ears four inches long, thin and pointed: holds grain well; somewhat hard to thresh; chaff white; beardless; grain large; yield per acre; grain 19½ bushels, straw one and a-half tons. South Australian variety.

Jade.—Sown 30th May; growth good, upright; colour pale bluish-green, very even, clean, and healthy; height five feet, neat and level; ripe 5th December; ears of good shape and size, beardless; chaff white, holds grain well; grain plump and of good quality; yield at the rate of: grain 28 bushels, straw one and a half tons per acre. This sort is like Purple-Straw, but gives better results than that variety here, it is not so subject to rust.

Yellow Bluestem.—Sown 31st May; germination slow and uneven; growth fair; habit when young low and creeping; foliage narrow, rich bluish green; late variety of slow growth, but very clean and fine; height five feet, fairly even; ripe 29th December; ears five inches in length, thin and pointed, rather loosely filled, beardless; chaff rich deep brown colour, very distinct, holds grain well, hard to thresh; grain is small, plump, red and white, and of good quality; yield at the rate of: grain 23½ bushels, straw two tons peracre. This distinct wheat is a selection from a mixed sample received from Manitoba.

Fife Essex.—Sown 3rd June; growth good; habit low and creeping; foliage narrow, of a pale bluish green, very clean and healthy; height five feet, level and neat; straw fine, clean, and of a bright colour, stands up fairly well; ripe 18th December; ears of fair size, beardless; chaff white, rather liable to shell the grain when fully ripe; grain small, white and plump, is of first-class quality; yield at the rate of: grain 27 bushels, straw two tons per acre. Good variety for hay or grain.

Medick.—Sown 4th June; growth upright, fairly even; foliage of a pale bluish green; height four feet; straw of fair quality, stands up well; ripe 18th December; ears three and a-half inches in length, of fair shape, and beardless; chaff of a pale brown colour and shells grain easily when fully ripe; grain plump and good; yield at the rate of: grain 20 bushels, straw one and a-half tons per acres.

Early Lambrigg.—Sown 10th June; growth rather uneven; habit dwarf and creeping; foliage wide, of a bluish green colour, rather yellow and sickly in places where the soil is low and wet; height four feet; straw stiff and upright, stands up nicely; ripe 22nd December; ears three inches in length, beardless, of good form and well filled; chaff of a pale dun colour, shells the grain easily when fully mature; good milling quality; yield per acre: grain 28 bushels, straw one and a-half tons.

Lambrigg White Lammas.—Sown 13th June; growth even and good; habit upright; foliage wide, of a pale, bluish green: very healthy and fine; height five feet, level and neat; ripe 20th December; ears large and well filled, beardless; chaff white, holds grain well; grain white, large and plump; good milling quality; yield at the rate of: grain 34 bushels, straw two tons per acre. Good variety for grain or hay.

Minnesota No. 169.—Sown 16th June; growth slow, but good; habit, when young, low and creeping; foliage narrow, of a deep bluish green, and healthy; height five feet, nice and level; straw fine, strong, and clear, of a glossy, pale yellow colour, and of superior quality; ripe 30th December; ears three inches long, beardless; chaff white and velvety; shells grain easily when dead ripe; first-class late variety for hay or grain in coastal districts; not suitable for dry places; grain, small and red, of excellent milling quality; yield at the rate of: grain 18½ bushels, straw two tons per acre.

Majestic.—Sown 20th June; growth fairly even; habit low and creeping; foliage of a pale bluish green, and healthy; height four feet six inches; straw of fair quality, stands up well; ripe 18th December; ears three and a-half inches long, beardless;

chaff of a pale brown colour, holds grain well; yield at the rate of: grain 20 bushels, straw one and a-half tons per acre. South Australian variety.

Marshall's No. 3.—Sown 19th June; growth even and fine; habit low and creeping; foliage of a pale bluish green, clean and healthy; height three feet six inches; good straw; stands well; this is a hardy wheat of dwarf growth; ripe 19th December; ears three inches long, good shape, beardless; holds grain well; rather hard to thresh; yield at the rate of: grain 22 bushels, straw one and a quarter tons per acre. South Australian variety.

Lambrigg Australian Talavera.—Sown 23rd June; growth strong and vigorous; habit upright; foliage of a bluish green colour, clean and healthy; height four feet six inches; straw good, stands up well; ripe 16th December; ears beardless, good shape and size, well filled; shell easily when fully ripe; grain white, plump, and good; yield per acre: grain 30 bushels, straw two tons. Good variety in the coastal districts for hay or grain.

Chettle's Excelsior English Seed.—Sown 25th June; germination good; growth very slow, but even and healthy; habit when young low and creeping; foliage a rich dark green; height five feet, level and fine; straw of good quality, stands up firmly; ripe 8th January; ears beardless, three inches long, nice square tips, well filled; chaff white, holds grain well; hard to thresh; grain red and plump, of a good quality; yield at the rate of: grain 32 bushels, straw two tons per acre; prolific but very late variety. Adapted only to the cooler late districts.

Australian x 172.—Sown 27th June; growth strong; habit upright; foliage of a pale green, even, and healthy; height four feet six inches, fairly level; straw stands up well, purple in colour; ripe 17th December; ears three and a-half inches long, good shape, well filled, beardless; chaff of a pale brown colour, holds grain well; grain heavy and fine; yield per acre: grain 25 bushels, straw one a-half tons. A plot of this wheat sown 12th July, gave equally good results.

Silver King.—Sown 27th June; growth healthy and robust; habit creeping; foliage of a pale bluish green colour; height four feet, fairly level; ripe 17th December; ears beardless and well filled; chaff of a pale brown colour, holds grain well; yield per acre: grain 21 bushels, straw one a-half tons. South Australian variety.

Australian x 77.—Sown 1st July; growth quick and vigorous; habit upright; foliage bright green; height five feet six inches; straw tinted purple, stands up fairly well; ripe 12th December; ears large, four inches long, well filled, beardless; chaff white; shells grain badly in windy weather, when ripe; grain white, long, and distinct; yield (best of any wheat tested here): grain 37½ bushels, and straw two and a-half tons per acre.

Australian x 67.—Sown 2nd July; growth upright and vigorous; foliage pale bluish green; height four feet six inches, level and good, stands up fairly well; ripe 1st December; ears three inches long, beardless and well filled; chaff white, holds grain well; yield per acre: grain 22 bushels, straw one and a-half tons. Very good early wheat for dry climate.

Australian x 167.—Sown 4th July; growth upright and robust; foliage wide, of a pale green, clean and healthy; height four feet, level, heavy crop; straw rather week, falls over; ripe 17th December; ears beardless, long and well filled; chaff white, open set, liable to shed some grain when dead ripe, otherwise a good wheat; yield per acre: grain 30 bushels, straw two tons.

Farrer's x 113/a/.—Sown 5th July; growth healthy and good, but not rank; foliage medium, of a pale bluish green; height three feet nine inches; straw good, stands firmly upright, clean and bright; ripe 16th December; ears two and a-half inches long, square shaped, close set, and well filled, few short awns on tips; chaff white, shells easily when fully ripe. Variety of neat dwarf habit, which should give good results in the drier districts. Yield very good: grain 36 bushels, straw two tons per acre.

Australian x 88/a/.—Sown 5th July; growth healthy and good; habit upright; foliage medium, of a bright green; height five feet, level; straw stands up fairly well, colour a rich purple; ripe 21st December; ears three and a-half inches long, beardless, pointed tips, well filled, holds well, nice showy grain; yield per acre: grain 32 bushels, straw two tons.

Nonpariel.—Sown 5th July; growth healthy and clean; habit upright; foliage medium, of a pale green; height four feet three inches; good straw, stands up well; ripe 19th December; ears good shape and fair size, beardless; chaff white, holds well; yield at the rate of: grain 20 bushels, straw one and a quarter tons per acre.

Allora Spring.—Sown 6th July; growth quick; habit upright; foliage pale green, even, and healthy; height four feet six inches, level; straw fair, colour a deep yellow; ripe 10th December; ears of fair size and good shape, beardless; chaff of brown colour, holds grain well; grain, white, small, and plump; yield per acre: grain 26 bushels, straw one and a-half tons.

Steinlee.—Sown 8th July; growth quick; habit upright; foliage light green; healthy and clean; height four feet six inches, level; ripe 9th December; ears beardless, of fair size, well filled, holds well; grain plump and good; yield per acre: grain 20 bushels, straw one and a-quarter tons; fair early variety.

Galland's Hybrid.—Sown 9th July; growth slow but healthy; height five feet, level and even; ripe 11th January; ears bearded, large and well filled; grain white, plump and heavy; yield good; grain 36 bushels, straw two tons per acre; hardy and prolific late wheat.

White Tuscan.—Sown 9th July; growth good strong and healthy; foliage dark green; height four feet six inches, level; ripe 2nd January; ears three and a-half inches long, beardless, good shape, well filled; chaff white, holds well; grain good; yield rate of grain: 28 bushels, straw one and a-half tons per acre.

Australian x 73.—Sown 9th July; growth healthy and vigorous; height four feet, level, stands up well; ripe 6th December; ears medium size, well filled, beardless; white chaff, holds grain well; yield rate of grain: 27 bushels, straw one and a-half tons per acre.

Toby's Luck.—Sown 11th July; growth rapid and healthy; habit upright; foliage bluish green; height three feet nine inches; level and neat; ripe 10th December; ears of good size, well filled; chaff white; few short beards on tips; holds well; grain large; yield, rate of: grain, 26 bushels; straw, one and a quarter ton per acre.

Rerraf.—Sown 11th July; growth even and healthy; habit creeping; foliage narrow, of a bluish green; height four feet; neat and level; straw fine, of good strength, and stands well; ripe 8th December; ears three inches long, pointed; chaff white; holds grain well; yield: grain, 28 bushels; straw, one and a quarter ton per acres. This early wheat should do well in the drier districts.

Champlan (Vilmorin) French Seed.—Sown 14th July; growth healthy, but at first slow; habit upright; foliage of a rich bluish green; height five feet; straw firm and upright; ripe 9th January; ears four inches long, beardless, nice shape, and well filled; chaff white; liable to shell slightly when dead ripe; grain red, large, and plump; yield, rate per acre: grain, 32 bushels; straw, two tons. Very promising new variety, which should be sown earlier.

Dart's Imperial.—Sown 11th July; growth slow, but healthy; foliage medium, of a rich deep green; height to five feet: fairly even; straw good, stands up well; ripe 9th January; ears of fair size, beardless; chaff white, holds grain well; yield, rate per acre: grain 18 bushels; straw one and a half tons. Fair late variety. South Australian wheat.

Dattel (Vilmorin) French Seed.—Sown 14th July; growth slow, weak, and uneven; foliage narrow, of a deep green; height four feet, stands up nicely; ripe 11th January; ears beardless, three and a half inches long, thick set, well filled; chaff of a reddish brown, shells grain easily; yield, rate per acre: grain 26 bushels; straw one and a half tons. Late variety; not desirable.

Australian x 145.—Sown 19th July; growth healthy, rather weak; height four feet; fairly even; straw good; ripe 25th December; ears beardless, small, and pointed; chaff white, holds grain well; yield poor, rate of: grain 13 bushels; straw one ton per acre. Not a desirable variety.

Red Lammas (Vilmorin) French Seed.—Sown 21st July; growth slow, fairly even; foliage of a bluish green; height three feet six inches, level; ripe 14th January; ears beardless, good shape; chaff brown; shells grain badly; grain red; yield, rate per acre: grain, 18 bushels; straw one and a quarter tons. Not a desirable variety.

Red Fife (*Canadian Seed*).—Sown 21st July; growth very slow and creeping; foliage narrow, of a bluish green; height three feet six inches; level; good straw; ripe 12th January; ears beardless, three and a-half inches long, good shape; chaff of a pale red; shells grain easily; grain small, red, of good milling quality; yield, fair rate of: grain, 17 bushels; straw, one and a quarter tons per acre. Late variety.

Largehead Yellow (*French Variety*).—Sown 21st July; growth very slow; height three feet; fairly even; stands well; ripe 18th January; ears beardless, short, and thick set, holds grain well; yield poor, at the rate of 10 bushels per acre; straw light. Not profitable here.

Trésor (*French Variety*).—Sown 21st July; growth slow and poor; height three feet; fairly even; stands well; rusty on flag; ripe 16th January; ears beardless; shells grain badly; yield: 10½ bushels per acre; straw light. Not desirable.

Minnesota 146.—Sown 21st July; growth very slow but healthy; habit, creeping; foliage narrow, of a deep green; height three feet six inches; good straw; ripe 14th January; ears beardless, fair size; chaff white, velvety; shells grain easily; yield, rate of: 13 bushels per acre; straw light; grain small, red. Good milling variety.

Bluestem.—Sown 21st July; growth very slow; habit creeping; foliage narrow, of a dark green; height three feet six inches; fairly even; good straw; ripe 15th January; ears beardless; chaff white, holds grain fairly well; grain red, small, good quality; yield at the rate of: 13½ bushels per acre. Requires to be sown early.

Australian x 82.—Sown 22nd July; growth upright and healthy; height four feet; even; straw weak, falls over; ripe 22nd December; ears beardless of good size, holds grain well. Not very promising.

Australian, x 146.—Sown 28nd July; growth even and vigorous; height four feet, level and neat; ripe 20th December; ears beardless, good size, well filled; chaff white, shells grain easily. Not very promising.

Australian x 63.—Sown 22nd July; growth good and healthy; height three feet six inches, stands up fairly well; ripe 22nd December; ears beardless, well filled; chaff white, holds grain well. Fair variety.

Australian x 100.—Sown 23rd July; growth quick and healthy; height three feet nine inches; fairly level; stands well; ripe 18th December; ears beardless, of good shape; chaff white, holds grain well. Fair variety.

Australian x 164.—Sown 23rd July; growth even, but rather slow; height three feet six inches; straw stands up well; ripe 24th December; ears beardless; chaff white, holds grain well. Not very promising.

Australian x 92.—Sown 23rd July; growth healthy and robust; height three feet nine inches; level; straw rather weak; ripe 26th December; ears beardless, long, and well filled; chaff white, holds grain well; grain long and distinct. Fair late variety.

Australian x 58.—Sown 23rd July; growth slow, healthy, and even; height three feet six inches; straw weak, falls about badly; ripe 28th December; ears beardless, fair size; chaff white, holds grain well. Late variety.

OATS.

Golden Fleece (American Seed).—Sown 30th June; growth upright, even, and very vigorous; foliage wide, dark green; height five feet; level; straw very thick and coarse, not good for hay; falls about badly; ripe 29th December; heads large and spreading; chaff and grain white; sample slightly mixed; yield, rate of: grain 33 bushels, straw 3 tons per acre. Best plants selected for further trial.

Garton's B.—Sown 16th July; growth even and good; height four feet six inches; straw coarse; stands up nicely; ripe 29th December; grain pale yellow, long, and plump; yield heavy, rate of: grain 49 bushels, straw 2¼ tons per acre.

Garton's C.—Sown 17th July; growth healthy; height five feet; straw coarse; rather badly laid in places; ripe 29th December; heads large and spreading, well filled with large white grain; yield, rate of: grain 49 bushels, straw 2 tons per acre.

Garton's D.—Sown 17th July; growth good; height five feet; fairly even: straw coarse; the heads break off badly when ripe. Owing to this fault it is not a desirable sort to cultivate. Ripe 30th December; yield per acre: grain 48 bushels, straw 2 tons.

Garton's A.—Sown 17th July; growth healthy; height four feet; straw coarse; falls over considerably; ripe 29th December; heads of fair size; grain white, good feeding quality; yield: grain 33 bushels; straw one and a half tons per acre.

Algerian.—Sown 19th July; growth rather weak; height four feet; level; straw of fair quality for hay; ripe 21st December; heads spreading, of good size and well filled; grain brown, long, and heavy; yield: grain 32 bushels, straw one ton per acre.

BARLEY.

Garton's B.—Sown 14th July; growth rather weak and uneven; height three feet six inches; ripe 18th December; ears of fair size and well filled; grain white, good malting; yield at the rate of 21 bushels per acre.

Chevalier.—Sown 15th July; growth weak and poor; height two feet six inches; fairly even; ripe 22nd December; ears good, well filled; nice heavy malting grain; yield at the rate of 25 bushels per acre.

Garton's A.—Sown 18th July; growth very robust; height three feet, fairly even; ripe 18th December; ears well filled; yield: 21 bushels per acre. Malting variety.

Nepaul (Hordeum Arifurcatum). Seed received from Dr. Morrison.—Sown 23rd July; growth upright, very quick, and strong; foliage wide, pale green; height two feet six inches; straw stands up nicely; ripe 1st December; ears short and thick; grain hulless, large pale brown; yield fair. Very distinct variety.

AGRICULTURAL LECTURES.

By A. Despeissis.

TWENTY-THIRD LECTURE—*(continued)*.

LEGUMINOUS FODDER PLANTS.

To this botanical family belong a number of plants which are either cultivated for fodder or grow naturally, wherever stock roam and graze.

While some are highly nutritious, others prove deadly poisonous, and of this class we unfortunately possess in Western Australia more than our equitable share.

Some of the fodder leguminous crops grown for stock have already been briefly described in speaking of pulses (cow pea, field pea, etc.). We will now give a short description of some of the other most useful plants of that family grown exclusively for fodder.

Vetches or Tares.

Natural Order—*Leguminosæ.*
Genus—*Vicia.*
Species—*Sativa.*

The name *Vicia* is derived from the Latin word *Vincere*— to bind, owing to the tendrils these plants possess, by which they attach or bind themselves to other plants.

Of Vetches or Tares there are a number of varieties, of which two are commonly cultivated as a catch crop or as a forage crop, viz.:—

Winter Vetches and Summer Vetches.

Under favourable conditions the vetch grows to the height of three to four feet, carrying from 6 to 10 pairs of leaves, on a tender succulent stem, and forming flowers of a purple and blue or reddish colour, closely sessile, or on very short stalks in the axils of the leaves.

The seed-pods are slightly hairy, splitting in two halves and containing several dark-coloured globular seeds.

Winter Vetches are hardier, and have obtained the character from having been sown in the autumn for a long period.

Vetches are grown for early forage or soiling purposes, *i.e.*, either for consumption on the land by sheep or in the yards or stables by cattle. If the former, they should be cut and given in racks to the sheep folded on the open dry stubble, and if the latter, each day's supply should be cut separately and carted off to the homestead as long as the crop lasts. They are also made into hay.

Vetches are a shallow-rooted crop, and deep tillage is not necessary. Strong loams are the most suitable soils.

Broadly speaking, the following leguminous crops grow best on the following soils:—

Leguminous Crops.	Soils.
Vetches	Strong soils, *i.e.*, clay loams or clay.
Lucerne	Medium soils, ordinary loams.
Sainfoin, Clover, and Lupins	Light soils, sandy loams, chalks, and gravel.

Summer vetches, although they do not occupy the land long, are unsuitable for the conditions which prevail in Western Australia.

It is desirable to make a number of sowings at different times, to have different breaks coming in rotation and giving a constant supply, which is eaten off in its most succulent stage.

The area of each portion sown should of course be determined by the number of stock kept and of days or weeks it is intended to furnish the supply of food.

Winter vetches should be sown at the rate of about half a bushel per acre one and a half inches deep. Some wheat, rye, barley, or beans are mixed with the seeds to keep the plants off the ground. Young rye is more palatable to stock than wheat, but wheat keeps pace better with vetches, rye growing too fast. They are most valuable for food when blossoming is just over and seeds begin to show.

When the crop is intended for hay, the cutting is done when the lower pods are forming. It is then turned frequently, and left as loose as possible, and mixed with layers of straw when built up in the stack. When used afterwards, the straw has so imbibed the juices and general flavour of the dried vetches as to render it equally palatable to stock, by which it is readily consumed.

For soiling, the cutting begins earlier, when the flowers begin to fade. They should be cut morning and evening, to prevent fermentation.

Vetches are also used for silage, and in that case it is generally sown with mixtures of seeds. For that purpose the following mixture is recommended:—

1¾ bushels vetches.
¼ bushel of rye or wheat.
½ bushel of beans.

2½ bushels per acre for autumn sowing.

It is cut when at its best with regard to all.

Vetches are also grown for seeds, and are manured sparingly. Phosphatic fertilisers are preferred to nitrogenous manures. Beans and vetches grown together produce more seed, which are easily separated at the time of threshing. The beans support the vetches, and both ripen at the same time. The straw of the beans mixed with vetches straw is better for stock. Sow one-half bushel of beans and 1½ bushels of vetches. Rape is sometimes sown with vetches for feeding.

LUPINS (*Lupinus var.*).

A few words about this and other leguminous plants will throw some light on their value either for fodder or for soil improvement.

Several varieties are planted according to the peculiar conditions of soil and climate.

Of these two varieties, the blue and the pink occur in patches in may localities in Western Australia, and as the question of their utilisation has often been raised, it is well to know something about their growth and their properties.

For a long time, and even now, those ever-spreading patches of lupins which are met with on our uncultivated land have been regarded as a noxious weed of no value, which gradually and effectually smothers, during its growth, all other vegetation.

Acres and acres of light loam and sandy soil have thus for years been abandoned to lupins until of late, settlers have found that those patches when reclaimed and sown to cereals such as rye, oats, barley or wheat gave far better results than similar land free from the lupin pest.

Especially is this the case in the more arid districts where, on account of its deep rooting habit, the lupins thrive to great perfection.

Their chief merit lies in absorbing nitrogen from the air and fixing it in their tissues, and also in bringing up to the surface stores of fertilising elements which their deep rooting habits displace from layers of soil, where more shallow rooted plants hardly ever reach, and depositing these substances close to the surface, where subsequent crops are able to make use of them.

As a crop for green manuring, lupins present decidedly good points in those drier districts where a quick winter growing hardy plant, capable of absorbing nitrogen from the air, deep rooting, and possessing at the proper stage of growth that succulence which is conducive to quick decay, can be grown to perfection.

Around Champion Bay and in the neighbourhood of Geraldton hundreds of acres of lupins which were looked upon as a troublesome weed, are now found to be excellent preparation for cereal crops.

As honey plants most lupins are valuable. Some varieties, and chiefly the white lupin, are valued in Portugal to suppress sorrel and other obstinate weeds on account of its close and easy growth.

Adaptation to soils.—For strong clayey soils, the large blue lupin and the pink lupin have proved themselves superior to the other varieties, although they thrive best on loamy soils.

For poor and sandy soils, on the other hand, such as are found in parts of Germany and of France, the yellow lupins are considered the best; they are said to thrive even on drift sands on the sea coast.

One observer points out that what the sainfoin is for the poorest limestone or marly soil, the yellow lupin is for sandy soil. On this class of soil the white lupin also gives good results.

Cultivation.—Lupins should be sown sufficiently early to catch the first rains, and when the soil is yet warm; they may then be ready for ploughing early in the spring. The pink and blue lupins are the quickest growers.

Soil Inoculation.—If it is desired to sow lupins on a piece of ground where they do not grow wild, or where they have never grown before, it is advisable to first inoculate the ground with the crop's peculiar tubercle-forming bacteria, in order to secure satisfactory results. This is done by carting some lupin soil taken from the first six inches and spreading it lightly over the surface, and cultivating and harrowing without delay, to prevent drying out, which would destroy the bacteria.

For Green Manuring, yellow lupin heads the list. It sends the roots deeper than the blue lupin; and rye is found to succeed much better after it than after the other lupins. White lupin yields a large quantity of foliage. Pink lupins and large blue lupins rank next, with the small blue lupin and the narrow leaved lupin following.

Lupin Seeds for Human Food.—The seeds of most lupins, if not all, are, in their natural state, poisonous to human beings, the poison consisting of a bitter alkaloid known as "lupinin." This active principle, however, is destroyed by boiling or by steeping in salt and water. Although not commonly used as an article of diet, the seeds are said to have been used by the ancient Egyptians, Greeks, and Romans, and are even now used in the South of

Europe. On the Continent of Europe, and notably in Germany, the torrefied seeds are frequently used as an adulterant of the cheaper grades of coffee.

Lupins for Forage.—The question of utilising lupins for forage has often been discussed by stockowners. Unless hard pushed, stock will not eat it on account, it is said, of the bitter taste of the leaves and seeds. It is known, on the other hand, that stock readily feed on plants much more bitter than lupins. The hairy or velvety nature of the leaves may possibly deter them from eating the plant when succulent and green; or it may be that stock, which in many cases cannot differentiate a poisonous plant from a non-poisonous one, are in this instance aware of the toxic properties of lupins, which is the least poisonous of the several species.

Of the several varieties, the yellow lupin is less bitter than the small blue, but it is said to be more injurious to cattle. It is also much more poisonous than the large white or the perennial lupin.

It is said that drying does not perceptibly affect the poisonous properties of the plant. Whether the process of ensilage neutralises these toxic properties, I cannot say; and experiments in that direction would be interesting.

The disease caused by lupin eating is called "lupinose," and is more severe among stock fed largely on lupin chaff. Sheep, cattle, horses, and goats are said to be subject to the disease.

The symptoms of the disease are loss of appetite, difficult respiration, high fever, spasms, and sometimes vertigo, resulting in death from four to twenty days.

THE LUCERNE.

Genus—*Medicago.*
Species—*Sativa.*

Lucerne takes its generic name from Media, whence the Romans brought it at the time of their conquest. It is also at times called Purple Medick, whilst in America it is designated by its Spanish name, "Alfalfa," which, however, is a Peruvian variety, which resists drought and frost better than the original European lucerne.

It belongs to the same order as the clovers, and, indeed, is closely allied to the genus *Trifolium* in all its leading botanical characters.

Lucerne, in the warmer climates, arrives at such luxuriant growth that it usually takes the first place in the estimation of keepers of any kind of stock. It is extensively grown in all warm climate countries; in parts of France, Italy, Spain; in South America, the Southern States of America, Peru; in India, Persia, and Australia.

In England it is only grown in Kent and the Southern counties.

The flowers are in racemes or clusters of a purplish blue colour.

Under proper management, and in a suitable soil and climate, the produce is very great, and owing to its perennial habit the annual outlay for labour is proportionately small.

To succeed with lucerne it is absolutely necessary that the soil be perfectly free from weeds, and reduced to a fine tilth. An ounce of lucerne seeds contains over 12,000 seeds; and it can thus be imagined that unless the soil be reduced to the finest possible tilth the little seeds buried under rough clods would fail to germinate. For that reason lucerne should never be planted on newly broken up land.

Soils.—Lucerne delights in a soil of a deep, dry character and of light description, in which its vigorous tap-roots can penetrate low down into the subsoil, and find its necessary supplies of food and moisture.

Calcareous loams are the best; all leguminous crops thrive where a moderate proportion of lime is present.

Preparation.—If the soil is at all heavy, it should first be well limed, and then ploughed fairly deeply, and stirred to a further depth of seven or eight inches by means of a subsoiling plough. After this the ground is harrowed, cultivated, cross-ploughed, and cultivated again until thoroughly pulverised.

Before sowing, the land is lightly rolled, to secure a smooth surface, and the seeds are sown and covered with a set of light harrows. It is essential before breaking up the land to clear it thoroughly of all weeds, whether annual or perennial, as they never can be properly eradicated afterwards.

Sowing.—The quantity of seeds varies in different climates. In cool and moist climates it is sown at the rate, if drilled, of 10 to 12 lbs. per acre; if broadcasted, 15 to 20 lbs. per acre.

In hotter and drier climates the quantity of seeds required need not be so heavy, if they are evenly distributed; and in such localities it is sown, if drilled, at the rate of 6 to 7lbs. per acre; if broadcasted, at 12 to 15 lbs. per acre.

A pound of seed contains about 200,000 seeds. It is thus seen that if 75 per cent. of them germinated, 10lbs. of seeds per acre would mean 1,500,000 lucerne plants, or 34 plants to the square foot, which is considerably more than could grow on that area.

If sown in drills, the seeds are best distributed by running over the smooth surface a light barrow carrying a long trough with holes at intervals through which the seeds are dropped. A spindle carrying small brushes inside, revolving over these holes, force the seeds out of the holes.

If broadcasted, the seeds are mixed with sand or with manure, and scattered in the usual way.

In Western Australia the early autumn is the best time for sowing, as the seeds falling on the warm earth come up readily with the first rains, and take a good hold of the ground with their roots in the winter, and start growing with great luxuriance when the spring comes.

Failing the autum sowing, the early spring should be chosen; but the young plants often then fail to satisfactorily tide over the dry, hot summer, unless helped along by irrigation or by artificial watering.

Treatment.—The first year it is not advisable to feed down the crop, as cattle, by heavily trampling down the crop, or pulling up the young plants, do a good deal of harm, and sheep feed it down too closely. The best plan is not to touch the crop unless the plants are strong and healthy, when they can be cut in the autumn, leaving two or three inches of stem to protect them from frost and encourage the growth of young lateral shoots.

The second and third year the crop is cut two or three times during the growing season, and stock may be turned on it in the autumn, but they should not be left two long, as they might feed on the plant too close and injure the crown, or they would trample down the young shoots.

The third year and after, three, four, and even five cuttings are effected, when the crop grows to a height of 12 to 18 inches. To obtain the best results the crop must be as free as possible from weeds and should receive a liberal dressing of good f.y.m. in the winter, or an equivalent in chemical fertilisers mixed with gypsum. If the ground sets too hard, the spader or the disc harrow may be run over the field every second year, in the winter, so as to loosen the surface of the ground.

Feeding off.—To take the full advantage of the crop, it should be cut green and carr'ed at once to the yards or stables for the cattle or the horses.

Green lucerne is apt to blow animals which first eat it too greedily, and should at first be given sparingly. If the green stuff is kept four or five hours to wilt slightly, it does not cause "hoven."

Lucerne is seldom made into hay, on account of the large proportion of moisture it contains, and because it also requires great care in stacking; even where well got up its bulk is smaller and its quality inferior to that made from clover, sainfoin, or vetches.

TWENTY-FOURTH LECTURE.

LEGUMINOUS FODDER CROPS (*continued*).

SAINFOIN (*Onobrychis sativa.*)

The generic name is from the Greek *onos*, an ass, and a word meaning to bray, asses being particularly fond of it.

It greatly resembles lucerne in its agricultural character. Sainfoin is a perennial deep-rooting plant, with branching, spreading stems, and leaves consisting of many pairs of oblong pointed leaflets, which are sometimes a little hairy on their under surface.

The flower stalks attain a height of from 2 to 2½ feet, and stand out beyond the leaves, carrying spikelets of purplish red flowers, which are succeeded by flat, hard pods containing the seeds.

Soils.—It has a considerable range of soils, and will grow on almost any soil, provided lime be present and no stagnant water be met with. This is as fatal to the healthy existence of sainfoin as to that of either lucerne or clovers.

To the poorer and lighter class of soils sainfoin is a valuable plant; extensive tracts of thin soils in the rounded hills of the chalk and limestone formations are laid down in sainfoin. The vigorous roots of the plant ramify through the clefts and vertical fissures of the rocks underneath, carry down with them both the air and rain water from above, and abstract from them and bring up to the surface large supplies of mineral food for the purpose of supporting their own development.

The land, at the time of sowing, must be perfectly clean. Deep cultivation is not so necessary as in the case of lucerne, as it would not pay. Sainfoin does not grow such large crops as lucerne, but is much hardier. It is best sown, like lucerne, in the autumn. If the seeds be in the rough state or in pods, 3 bushels are sown to the acre; if husked or milled, 1½ bushels. It is important to use fresh seeds. This is determined by opening the husk and cutting the seed across the middle. Good seeds should be plump, of a light gray colour outside, and of a greenish tint inside. If of a dark colour, it has either been badly matured, or else has been injured in the stack. It is better sown a little deeper than the clover seed. A double turn with the seed harrows and the light roller finishes the operation.

In the Southern and South-Western counties of England, where it is fairly extensively grown, the sainfoin is left down 8 to 10 or even 12 years, and is followed with a regular rotation, commencing usually with wheat.

Sainfoin is not grown in the North, where there is not much lime formation, and also on account of the more severe climate.

Management of the Crop.—It is best to cut it the first year, to strengthen the roots. It takes three years, like lucerne, before it gets to its best; it maintains so up to the fifth year, and then gradually degenerates. In order to protect the crop from the natural grasses, give it a good turn with the harrows at the close of the winter. This will displace the shallow rooted weeds. Then apply the dressing of manure, by which the growth of the cultivated crop will be encouraged.

The crop flowers about midsummer. If intended to make into hay it should be cut before the flowering is fully out, as the plant has then attained its maximum value. If allowed to seed, the plant often dies.

The most economical way of consuming sainfoin would be to cut it green, in the same manner as lucerne, and feed stock. In such a case, if kept well manured every winter, it would probably yield three cuttings in the course of the season, and give a far larger produce than when left to blossom and make into hay.

Diseases.—The greatest damage done to the crop is effected by natural grasses and weeds, which choke it. Slugs and a small weevil in its early growth also cause much damage. Imported seed should be kept for some time and fumigated, to guard against the introduction of weevils.

Chemical Constituents.—The mineral constituents of sainfoin greatly resemble those of lucerne and clover. They require large proportions of lime and sulphuric acid, best applied in the shape of gypsum, and a comparatively small proportion of phosphoric acid. In all cases a calcareous soil, rather than a soil rich in phosphates, appears necessary to their healthy growth. As lime and sulphuric acid are fairly cheap fertilisers, they may always be added in liberal dressings to the soil intended for those crops.

THE CLOVERS.

The clovers constitute most valuable fodder crops. They belong to the *Leguminosæ*. The generic name is *Trifolium*, on account of the leaves, which are composed of three leaflets, having generally a white streaky mark in their centre; the stems are herbaceous, not twining; the flowers form a compact globular or rather oblong head, furnished with a straight seed-pod, not jointed, and containing but one or two, very rarely three or even four seeds.

Most clovers come from the warmer regions of Europe and Asia; only two are indigenous to the Eastern States of North America; a few from California; none occur in Australia; few are found in South Africa. They are now grown in every warm country in the world.

The following species are those most commonly met with in cultivation:—

Trifolium Alexandrinum (the Bersin Clover of Egypt), also called Egyptian clover, where it constitutes an important fodder crop. It is also grown in N.E. Africa, S. Europe, and S.W. Asia. On the Nile it is said to give three green crops, each up to two feet high, during the season. It is an annual. The seeds often contain impurities such as dodder (Cuscutes) seeds, and should, for that reason, be sifted. The flowers are pale yellow or whitish. Twenty pounds of seeds are required to plant an acre.

It would probably be a very desirable species to grow in Western Australia.

Trifolium incarnatum (Crimson or Italian clover) is an annual, and is a native of Southern Europe. It differs in appearance from the other clovers in several respects. The roots are comparatively fibrous; the stems are covered with a downy sort of hair, and branch just at the ground, but not afterwards; the leaves have leaflets very nearly rounded, and very downy; the flowers are long and cylindrical, instead of round and globular; their colour is deep crimson.

This clover flowers earlier than most others. It is grown in the Southern Counties of England, and never in the North. Where grown, it is harrowed in on stubble fields, to obtain an early feed of great fattening value. In France and Belgium it is well grown, its chief usefulness being for winter growth. For that reason, and also considering that wherever it grows it leaves the soil the richer in nitrogen, it is one of the best winter crops to grow in orchards and vineyards on soil deficient in vegetable mould. It succeeds remarkably well in Western Australia; and for several years past I have sown it in the autumn, with most satisfactory results, amongst vines. It does best on a firm seed bed, and, where grown on stubble, the practice is simply to run the cultivator over the stubble in the autumn and sow the seeds. This crop is especially recommended for winter fodder in gypsum regions.

When drilled, the seeds are sown about eight inches apart, the quantity of seeds varying between 14 to 28 lbs. per acre. They are bush harrowed. The seeds are the largest of the clovers, and differ from those of *T. pratense*, or ordinary red clover, by being white to brown-yellow. They are oval in shape, and rounded in section. The surface is glossy and polished.

A white flowering variety exists; it is a good bee plant. This crop is used for soiling cattle in stables, and for feeding off by sheep. It gives no aftermath, and its hay is inferior to other clovers, and for that reason it is more generally used for soiling.

Trifolium resupinatum (the annual Strawberry Clover), an annual from South Europe and North Africa to Persia, grows also in the Canary Islands and the Azores. It is cultivated in Upper India where it is highly thought of as a pasture plant. It will live through drought and floods.

Trifolium hybridum (the Alsike Clover) is considered a hybrid between the Red Clover (*T. pratense*) and the White or Dutch Clover (*T. repens*). It is a native of Northern Africa and Western Asia, and a valuable perennial pasture herb, particularly for moist localities.

It has all the productive qualities of the Red, combined with the durable character of the "White Dutch," and is in consequence extremely valuable for pasture or for soiling. On lands where Red Clover is attacked with "Clover sickness" the Alsike will often answer admirably.

It is the best kind for irrigation; the roots are fibrous; the stem perfectly erect; the leaf midway between the ovate of the Red and the obcordate of the White Clover, the margin is slightly toothed; stem and leaves are hairless; the leaves have the pale green colour and the transparency of *T. repens*; the flowers are whitish with a dash of pink, and are more like the White Clover's; the stalk is also ribbed.

The Alsike Clover is not strictly permanent, but lasts a few years.

It is brought into mixtures instead of the Broad Red Clover to prevent "clover sickness." The seeds are of the same size as *T. repens* (White Clover). The colour, however, varies from pale yellowish green to very dark purplish green, almost black.

Trifolium pratense or *Broad Red Clover*.—This is the ordinary Red Clover. The plant is said to be indigenous to all Europe and North Africa. It possesses thick roots, thus differing from the perennial variety of that name, *T. pratense perenne*. The leaves are rounder in form, and the stem at first more and after less hairy than *T. pratense perenne*.

The flowers are reddish purple, and sometimes pale pink. There is also a white variety. The margins of the leaves are smooth, although hairy.

This clover is not adapted for permanent pastures, but to rotation husbandry, being the most short lived of all the clovers. It is also the most liable to "clover sickness," and its recurrence should therefore be kept well apart in the rotation. Its great root growth during the two years of its existence enriches the ground in nitrogen, and constitutes a very good preparation for succeeding crops, especially cereals.

Cut fresh it produces six to eight tons of a nutritious and sweet herbage. This, if turned into hay, produces one and a-half to two tons of dry fodder, the shrinkage being three-quarters of the fresh state. Red Clover is now extensively cultivated in New Zealand, where, however, it did not fertilise until the humble-bee was introduced. Since the introduction of this insect, which sucks the nectar of the flowers and fertilises them, the aftermath of Red Clover is allowed to go to seed, of which 200 to 300lbs. per acre are threshed. These sell at about 5d. per lb., and yield from £4 to £6 per acre. These seeds are the largest of all clover seeds, with the exception of those of *T. incarnatum*. They are flattish and irregularly kidney-shaped in form. They vary in colour from pale yellow to deep purple.

Trifolium repens.—White or Dutch Clover, the Shamrock of Ireland or Creeping Trifolium, so called on account of its creeping habit. It has both fibrous and tap-roots, which enable it to thrive in a great variety of soils.

The stems are solid and prostrate and distinctly creeping; the flower stalks spring up perpendicularly to the ground, and so also does the leaf stalk. It takes root at the joints and is a perennial herb.

The White Clovers flower all through the summer, the flower being white, occasionally tinged with pink. At the base of the floral head is a brown fringe, owing to partial withering.

The leaflets are obcordate in form. The leaves are of a pale green colour, and hairless, as is also the stem. They have white blotches arranged in stripes.

The plant is too dwarf to be cut for hay. For grazing, however, especially on poor land, white clover is invaluable. It comes up very luxuriantly where land has been dressed with superphosphate or with gypsum.

The seeds resemble those of Red Clover, not so long, a little flatter and somewhat triangular. In colour they vary from pale yellow to brown. When sown alone, from six to eight pounds of seed should be used, but is generally mixed with the seeds of other clovers or herbs. The forage, though not very abundant, is sweet and nutritious, and is better for flesh than for milk, being especially valuable in fattening sheep.

The Bur Clover (*Medicago denticulata*), or Medick Bur, is an annual clover, a native of the south of Europe. It is neither as nutritious nor as palatable as many other clovers, but, coming up early, supplies a bite when the other more useful clovers are not yet ready. Stock of all kinds do well upon the burs, which they pick from the plant while it is growing and afterwards from the ground after the foliage has dried and disappeared. The prickly burs become entangled in the wool of sheep and somewhat spoil its value. To establish this clover the seeds may be scattered broadcast when the first rains come.

The Hop Clover (*Medicago lupulina*), or yellow clover, an annual or biennial clover, grown as a pasture plant in wet meadows and on stiff clayey soils which are too poor for lucerne or the clovers. It remains green through the driest summer.

Bokahra or Cabul Clover (*Melilotus alba.*).—The generic name melilotus is derived from the Latin *Meli.* honey.

This is a biennial herb, on account of its fragrance sometimes mixed with hay. An odorous principle known as "comarin" is extracted from it.

Like most plants of that family, it is not much grown on account of its coarse, fibrous stems and its small yield.

Pigs are said to devour this herb with avidity, whilst as a bee plant it is certainly useful.

THE GORSE OR FURZE (*Ulex*).

This is a hardy shrub of the leguminous family; it is green, branched, and bushy. The leaves and young shoots are converted into short, thick, spreading and very intricate spines or prickles. The flowers are yellow. Of Gorse there are three varieties:—

First, the European Gorse (*Ulex Europeus*), which is more commonly cultivated, which, in a suitable soil and carefully attended to, produces a large return of a nutritious and palatable food, green and succulent when there is no green fodder about. It is much liked by all kinds of stock, the only drawback to its use is the necessity that exists of bruising or crushing it in order to reduce the spines or prickles with which it is covered. A variety of simple and inexpensive machines have been designed for effecting this.

The Dwarf Gorse (*Ulex nanus*) is another variety grown on even poorer soil. It reaches a height of three or four feet, and in the Department of the Landes in France it furnishes a supply of fodder, fuel, and litter.

The Irish Gorse (*Ulex stricta*) has a more compact habit of growth. The spines are soft and require no preparation.

Cultivation.—It grows well on most soils, but especially on dry, sandy, and gravelly soils, not as a rotation crop, but merely as a crop producing a return in soils, and under conditions of cultivation unsuitable to regular farm plants.

It is very deep-rooted and is thus able to draw nourishment and moisture from the subsoil.

The seeds and land should be clean, as the crop is intended to be of some years duration.

The seeds are drilled at the rate of 10 to 15 pounds per acre for forage or for game cover. The rows are drilled from 18 to 24 inches apart. Every alternate row is cut with the hook or scythe each year, thus giving each row a two years growth.

It is a valuable food for horses, milking cows, and working cattle. In some parts of Ireland and Wales the farm horses are largely maintained upon it during the winter months, the crushed two year old branches being fed at the rate of about 30lbs. per day.

It is important not to allow the food to remain long after being crushed, as fermentation is quickly set up and deterioration ensues. It is a good practice to mix it at once with cut straw and hay chaff, which absorbs the juices and enables it to keep good for much longer.

TWENTY-FIFTH LECTURE.

SOME AUSTRALIAN LEGUMINOUS FODDER PLANTS.

The Leguminous family furnishes several useful forage plants to the Australian native flora, and amongst others the following, which belong to the genera:—Trigonella, Swainsona, and Acacia.

The Scented or Darling Clover (*Trigonella suavissima*), named from two words meaning three and knees or angles.

This plant is an annual, and under favourable circumstances a perennial herb, which grows over the interior of Australia, from the Murray River and its tributaries to Sharks Bay, in Western Australia. It is not recorded in Queensland.

The plant has creeping or erect stems of one to three feet in height. The leaves are clover-like, and composed of three leaflets, the middle one being stalked; they are obovate in shape and about half an inch long. The flowers are yellow, in bundles over a short stalk, coming out at the axils of the leaves. They are succeeded by somewhat curved pods of half to three-quarters of an inch long. It is a free-seeding plant, a feature which enables it to renew itself with ease in spite of adverse climatic conditions. Its cultivation for the sake of the seeds alone should mark it as a profitable plant to grow, as when brought under systematic cultivation it is likely to prove an invaluable substitute in those drier inland districts where the clovers are not likely to succeed. It is even not unlikely that, cultivated under more favourable circumstances alongside some of our best clovers, in the moister localities, it may prove a close rival to it on account of its hardiness, the great amount of herbage it produces, its extreme fattening qualities, and the liking stock of all descriptions show for it.

When found growing on the rich black alluvial soils which are periodically flooded by the rising water of streams or rivers it produces large quantities of herbage. On the other hand, it is also found growing on stony ridges, and it comes out after the first rains and before the other grasses begin to show. The seeds are best sown in the autumn, when our wet season sets in. The North-West, where summer rains are more frequent than winter rains, the time of sowing should be guided by the breaking of the dry season.

From eight to twelve pounds of seeds would sow an acre.

The Scented or Darling Pea was used as a spinage during Sir Thomas Mitchell's expedition. It is the only species of the genus found in Australia, and it is endemic.

Fenugreek.

Trigonella fœnum græcum.—This is a European and Asiatic representative of the same family. It is an annual herb, not so much grown for the herbage it produces as for its fragrant seeds, which were much in demand among the ancient Egyptians, Greeks, and Romans. The foliage is used in some oriental countries as a vegetable, and it is also mixed with musty hay to screen the mouldy flavour. It possesses the same smell as Bokhara clover, and contains the odoriferous principle *Conmarine.* Cattle are fond of this smell, and for this reason some of the concentrated cattle foods are flavoured with it.

Fenugreek powder is also used in veterinary medicines and quack cattle drugs, which are highly prized by ignorant grooms and stock owners.

The Swainsonas.

Of these there are several species known in Australia. They grow in the more arid regions of the interior, and when eaten by stock in conjunction with other herbs they constitute good browsing plants. Like all other plants of the leguminous family, however, they are apt, when eaten too greedily whilst in the succulent stage, to cause the blowing of animals, a trouble also known as "hoven." This is caused by the large production of gases in the stomach or paunch of the animal, which swells and, by pressing against the lungs, interfere with the working of that organ, and may produce death. In that case, a puncture of the skin and of the sac of the paunch brings relief, and often saves the animal.

Whilst some *Swainsonas* are useful herbs, others known as "Darling Pea," "Indigo" or "Cranky Pea," are held as poisonous by stockowners. There is some difference of opinion on this subject, however, and although it is admitted that sheep rarely eat it, yet some take to it as kindly as the Chinese take to opium and then rarely ever eat grass again, lose their condition, and prove a source of great loss to their owners.

Some stockmen say that salt is an antidote for this trouble, and that pea-eating sheep when killed are found to be full of worms. Now salt, it is well known, is very useful in combating internal worms, and whether worms drive sheep to become pea-eaters, or whether the eating of the pea is followed by an invasion of worms, is a problem which has not yet been satisfactorily cleared. The fact nevertheless remains that in a flock depastured in paddocks where the Darling Pea grows, most pea-eaters are a dead loss to their owners.

Cassias and Acacias.

I will merely mention these as forage shrubs and trees of great importance in the arid interior.

Some of the species are valuable from the fact that neither drought, hot winds, nor sand blasts seem to seriously affect their growth. The leaves of many of these are narrow and spike-like, a structure which affords very little surface for evaporation. The roots on the other hand are tough and vigorous. Stock of all sorts are very fond of the tender shoots as well as of the seed-pods of these shrubs, which, in periods of protracted droughts, are often cut down to supply food for the famished stock.

SOME OTHER FORAGE CROPS.

Besides the crops which we have already described, a number of others are cultivated for the purpose of supplying the raw material required in the manufacture of meat, milk, wool, and other produce, we derive from our farm stock.

The Rape Crop

belongs to the Cruciferous order and to the genus *Brassica*.

Two species occur:—

(1). *B. campestris*, or Smooth-leaved Summer Rape, or "Colza."

(2.) *B. napus*, or Rough-leaved Winter Rape, or Cole seed.

In the first the principal root is more cylindrical, the leaves are smooth, fleshy, and of a sea-green tint; the flowers of a bright yellow colour, appearing late in the season.

In the second the root is more spindle-shaped; the leaves of a vivid green, rougher on the surface and less rounded at their extremities. The flowers are of a darker yellow.

In members of the Cruciferous family one or two organs of the plant more particularly reach an abnormal development. In the case of the rape it is the stems and leaves which attain an exaggerated growth.

Soils.—The rape, like the cabbage, is a typical crop for heavy alluvial soils. Where there is a good deal of peat and humus heavy crops are obtained.

B. campestris, or Summer Rape, is the best adapted for growing in the stronger clay class of soil.

B. napus, or Winter rape, for the humous soil.

The physical conditions of the soil required are the same as in the case of the other crops of the same family, viz., depth, fineness of division (tilth), and freedom from stagnant water.

As the crop produces an exceedingly large amount of organic matter in a short time, much manure in a very assimilable form is needed.

In addition to well rotted farm-yard manure, if procurable, 2 to 4 cwts. of superphosphate of lime will always pay, whilst the rape being a salt-loving plant an addition of common salt is also beneficial.

For sowing on those damp salt patches which occur in hollows in the wheat fields in the Eastern districts, rape should prove a very profitable crop.

The seeds are sown broadcast or are drilled. When drilled on well pulverised ground 10 to 15 inches apart, four to six lbs. per acre mixed with concentrated manure in the drill box are used. During the early stage, horse hoeing is carried on, and if too thickly sown the plants may be singled out. When unchecked by injury from the weather or from insects it soon reaches its full development and grows into a vigorous plant three to four feet high, with fleshy leaves and a full succulent stem, which is the part most relished by sheep, and is eaten down entirely to the ground.

In feeding it off by sheep, these should be folded behind movable hurdles, a small break being given them at first and gradually increased; the stock should be carefully watched, as owing to the richness and succulence of the keep, inflammatory attacks of the intestines sometimes ensue. It is generally the practice in England to have some dry food as straw or chaff on the ground for the sheep to resort to.

The Colza oil is extracted from the ripe seeds, and is found to contain on the average from about 35 to 40 per cent. of oil, which possesses a disagreeable smell and taste, and being classed among the non-drying oils, is only used for lighting, lubricating, and other inferior purposes. This oil is obtained from the seed by pressure, the residuum being the well-known rape-cake of commerce. This, however, always contains beside, the solid matters of the seed, a considerable proportion of oil—on the average about 10 per cent.—which, under the ordinary process of manufacture, cannot be extracted by the pressure applied. This residuum or "cake" is used largely as a feeding, and also as a manuring substance, for both of which purposes its composition shows it to be well adapted, being rich in nitrogenous matter, and in phosphates, containing 5 to 6 per cent. of nitrogen, equivalent to 6 to 7·3 per cent. ammonia and 3½ to 5½ per cent. of phosphates, besides a large proportion of vegetable and organic matter. It is for that purpose applied at the rate of 4 to 8cwt. to the acre, and also acts as a destructive agent of wire worms, which are the larvæ of the click beetle.

It differs from "linseed-cake" in its peculiar bitter taste, which makes it less palatable to cattle, to which it should be given at first in small quantities and gradually increasing the amount as the animal gets accustomed to it.

The Mustard Crop.

This also belongs to the Cruciferous family. Its generic name is *Sinapis*, of which there are two species.

S. alba.—A white mustard, with stems and branches covered with rough hairs.

S. nigra, or Brown Mustard, with stems and branches smooth.

Both are annuals, and are readily known by their brilliant yellow flowers.

The former is grown as a forage crop. The second for its seeds. Several noxious weeds are allied to it, viz., "The Charlock," or "Wild Mustard," *S. arvensis.*

The crop is not one suitable to the conditions which obtain in this State, as it requires plenty of moisture which it would get during the winter months, but, on the other hand, it is sensitive to frost, and for that reason is not safe to sow during our wintry moist season.

In localities fairly free from frosts white mustard is sown at the rate of half to one peck to the acre, the seeds being covered by harrowing twice, the second stroke being across the first.

The crop is utilised either as:—

(1.) Forage, the feeding off commencing before flowering, as afterwards the plant becomes more fibrous, and its feeding properties begin to decrease.

(2.) Green manuring of fields poor in vegetable mould, and where farm-yard manure is not procurable. For this purpose it is broadcasted pretty thickly and a light roller run over it previous to ploughing it in. The work is then better done and the vegetable matter is decomposed more speedily than when buried in a comparatively unbruised state.

Weight for weight the feeding power of mustard exceeds that of the turnips, while the large proportion of mineral matters which it extracts from the soil during its growth explains the cause why it is so valuable as a green manure for ploughing in, as a preparation for wheat and other cultivated crops.

The Cabbage Crop

is the type of the Cruciferous crop. The generic name *Brassica* is said to have been borrowed by Pliny from the Celtic *Bresic*, which means cabbage.

Of cabbages there are a vast number of varieties cultivated as culinary vegetables on the farm, for agricultural purposes. These may be classed under two divisions:—

(1.) The compact varieties ...	Drumhead or Common Cattle Cabbage, Anfield, etc.
(2.) The open-headed varieties...	Thousand Head, Giant Cow Cabbage or Palm Cabbage, Jersey Kale.

By some it is held as an exhausting crop, but if we reduce the business of farming and agriculture to its simplest formula we should define it as the conversion of inorganic or mineral matter into organised structures through the agency of vegetable life—or the plants we cultivate—and under ordinary conditions and skilful management it should be a benefit rather than a loss to the cultivator.

As a general rule, the crop which in the shortest time can take the most out of the soil, *i.e.*, convert most mineral substances into food materials, is, other things being equal, the most beneficial for cultivation.

Sowing.—Cabbages are almost invariably first grown in a well-selected and sheltered seed-bed, abundantly manured, the seeds being sown in the autumn. Two square rods of seed-bed are sufficient for each acre to be cropped, and 4ozs. of seed will be found sufficient to stock this surface; about 5,000 to 7,000 plants are generally required to the acre. It is desirable to have a succession of young plants coming on, to meet the requirements on the farm for plants.

The Soils.—The soils most suitable are the heavier rich loams (clay and sand). Deep cultivation is very desirable, and heavy manuring is required, viz., 10 or 12 tons of stable manure, with 3 to 5 cwt. of superphosphate of lime previously mixed with as many bushels of ashes or other suitable material. To this as well as to other plants of marine origin common salt may always be applied with advantage.

Planting.—Cabbages are planted in the field on ridges, or if on the flat in rows, to lessen the necessity of hand-hoeing. The distance apart is often, for globular heads, two and a half feet, giving six and a quarter square feet of surface to each plant, which means 7,000 plants per acre; for open-headed varieties the distance should be three feet apart, each plant having nine square feet, and 4,840 plants going to the acre.

The young plants are taken up carefully from the seed-bed and the roots should be examined for "clubbing," which are excrescences on the roots, these should be cut off with a knife and the roots dipped into some muddy mixture (liquid manure and soil) to prevent drying off too quickly. They should be transplanted as quickly as possible. Should they not look very luxuriant, nitrate of soda or sulphate of ammonia, at the rate of 1 to 2cwt., are sown round the plants, these fertilisers acting as a quick tonic, destroying grubs, snails, and slugs. Blanks may occur, and these must be filled in.

In dry weather it may be necessary to water the crop.

Harvest.—They should be cut off with a stout hook or "bill-hook." The stems may then sprout at the axils of the old leaves, and this may afford good green food for sheep or cattle. The stalks should not, however, be allowed to remain standing in the field, as they afford food for a number of noxious insects attracted by the rotting roots and stems, which do some injury to the following crop.

The weight of a good crop is about 20 tons.

In giving cabbages to milk cows, the lower leaves which begin to decay must be removed, as they might taint the milk.

The Drumhead generally comes to maturity first.

The Giant Cow Cabbage, the Palm Cabbage, and the Jersey Kale attain sometimes the height of 12 feet, carrying leaves all up the growing stem, which may be stripped off as the growth progresses, leaving the upper part to furnish the principal crop.

Of the compact-headed varieties the Strassburg Cabbage grows, perhaps, to the largest size, weighing as much as 40 to 56lbs.

In Europe the practice is to cut up these large cabbages in slices, as is done for roots (turnips, mangels, etc.), and give them, mixed with straw and hay chaff, to all farm stock, working horses as well as feeding cattle. The stalks are given to pigs. Weight for weight the "open-headed" varieties are more nutritive than the "compact-headed," and when the crop is for home consumption it is more profitable to cultivate the former than the latter, as it is found that the outer leaves contain a much larger amount of food material than those forming the heart of the plant.

IN SEARCH OF PARASITES.

The following letter has been received by the Director of Agriculture from Mr. Compere, who is at present in Europe searching for parasites:—

I have placed on board the steamer "Arcadia" at Marseilles, a package of insects, addressed to you, and instructed the officer to wire to you from Fremantle, and in case the steamer leaves before you can get a man down to receive them, then to place them in charge of the Customs officers.

Following is the contents of the packages:—

(1.) One box contains a number of *aspidiotus* feeding lady-birds, collected at Seville, Spain. These have liberated in any orchard infested with red, San José, or greedy scale.

(2.) Another box contains the larvæ and pupa of one of the most valuable lady-birds which I have yet noticed. This feeds upon curious species of *Dactylopius*. The larvæ of these I collected at Malaga, and was fortunate enough to find some food for them at Cadiz, and I think that some of them will arrive alive. I would suggest that you have a lot of the mealy bug collected and placed in one of the breeding jars in the office, for the purpose of breeding them. The beetles of these will feed upon various species of scale, but the larvæ will only feed upon the mealy bug. A few of the beetles will be noticed in the package first mentioned.

(3.) Another box contains two or three species of aphis-feeding lady-birds, collected at Malaga and Seville.

(4.) And in another box will be found a few of another species, which is a very small one, feeding upon the Black Orange aphis. The larvæ of this resembles that of *Chryptolæmus*, and in the box will be noticed some parasites of the same aphis. These may not reach you alive, as I could not get fresh food for them to deposit their eggs in. If alive, liberate in any orchard where they are likely to find food.

(5.) There is also a small package containing two species of Syrphus fly feeding upon aphis, collected at Malaga.

(6.) Another small package contains a few specimens of lady-birds found feeding upon red mite on pear trees here at Marseilles.

(7.) Another box contains wheat, which was at time of finding alive with parasites of the grain moth (*Gelechia Cerealella*), and I am not sure but there are some parasites on the grain weevil in this lot. From Valentia, Spain.

(8.) Last, but not least, two boxes which contain two species of parasites of the grape scale (*Lecanium Cymbiform*). One species works on the young larvæ, while the other works on the full-grown scale, and it is not uncommon to notice a single dead scale with as many as nine holes in the back. It is a difficult matter, however, to find live specimens of this scale here. Have sent you all which I have been able to collect, but shall try and find some more at Nice. These I would suggest, if arrive in good condition, to liberate all in one garden where there is scale. People here did not know that such a scale was to be found, and are surprised when I find a specimen, and say it is the first they have seen. There may be three species of parasites, but of this I am not sure, as I have only seen two.

(9.) Up to the present time I have found four species of parasites upon the codlin moth, but this season nothing more can be done, as it is too late now. Shall leave for Nice this morning. I trust that these insects reach you in good condition.

Mr. Despeissis, in commenting on the above report, says:—

By the S.S. "Arcadia" the third, but the first successful, consignment of orchard and farm pests parasites came to hand.

The first two consignments were posted in Barcelona and Valencia, in Spain, whence they journeyed in the ordinary mail bags to Marseilles, and when opened here the majority of the insects were dead.

In this instance Mr. Compere placed the package himself on board the P. and O. boat at Marseilles, and, through the good offices of the mail boat officers, it was kept in the cool chamber, where the temperature is not so severe as in the cold storage chambers.

The several packages numbered contained the insects mentioned in Mr. Compere's letter of the 24th April. After transferring the live insects into the breeding-jars, the packages were destroyed by fire, to guard against the possible introduction of mites and other destructive insects. Several secondary parasites or insects parasitic on the beneficial parasites were also captured and destroyed, the only insects liberated being healthy; and the colonies, instead of being split up, are liberated in as strong numbers as possible on plants well provided with food for them.

Mr. Bailey sorts them out every day and attends to that work, keeping a record of numbers and kinds of insects liberated, where, and when.

He reports having liberated—

2 Syrphus flies.
6 Red mite feeding lady-birds.
33 Parasites of *Lecanium cymbiform* (large grape scale).
50 *Aspidiotus* feeding lady-birds (on red scale).
40 Large aphis-feeding lady-birds.

Whilst in Sydney last year Mr. Compere had an interview with Mr. J. Kidd, Minister for Agriculture, and, from what he told me, the New South Wales Department showed some willingness to contribute to the expense of the mission entrusted to our entomologist. The discovery of parasites of codlin moth is of considerable interest to the Eastern States, where that pest does incalculable damage to apple orchards; and the information, if conveyed to the States most interested, would probably lead to their joining with us in the direction we have already embarked upon.

THE DESTRUCTION OF ZAMIA PLANTS.

The following interesting item, dealing with the destruction of the Zamia plant, is taken from a report by Mr. G. A. Glen, an inspector in the Stock Department:—

"Hearing from a man named McKenna that kerosene was a sure thing to kill palms, I tried the experiment on some palms on Mr. V. C. Mitchell's estate, and as you will see from his letter to me, which I enclose, it is a complete success. This, I think, is very useful for farmers to know, as they always attribute rickets in cattle to palms, and as one spoonful of oil poured down the centre of the palm kills them, it is a very cheap method of getting rid of the trouble."

The following is Mr. Mitchell's letter referred to:—"According to promise, I write a line to let you know the result of the experiment on the palms you put the kerosene oil to. The lot of them are completely dead underground, but to look at them a few yards off you would not think anything the matter with them; but when you pull at them the whole plant pulls up quite easily, and is rotten, so there is no mistake of its being a sure cure and killing them. I intend using some oil to a small patch of palms in my paddocks as soon as I have time."

CULTIVATION OF WHEAT.

By Percy G. Wicken.

(Continued from page 356.)

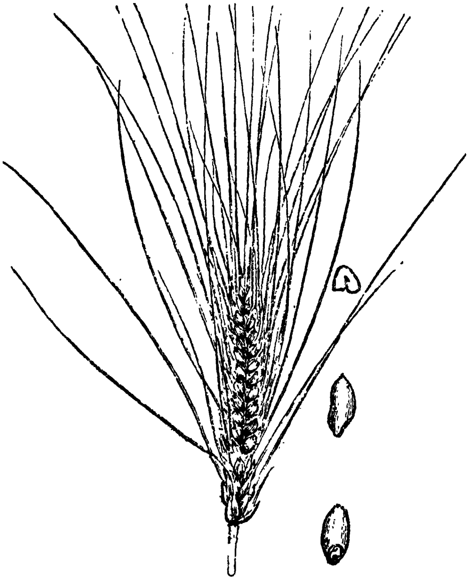
White Lammas.—Tall, with strong whitish straw of medium size. The ears are smooth, bald, long, very regular, somewhat open, tapering, square, erect or leaning, a trifle curved, acute at the tip, abrupt at the base, where there are two or three sterile spikelets, whitish, with the tips of the chaff almost salmon coloured. The spikelets are narrow and contain two grains; the chaff shiny, streaked with colour at the tip, medium length, blunt, very short awned towards the tip of the ear, rather stiff and thick, rather deep, round-backed, firmly attached, and lies pretty close to the grain; there is little or no shelling. The grain is large, long, straight, plump, opaque, yellowish, rather plump-bosomed, quite blunt at both ends, and has a long and abundant brush, deep crease, and mealy cross-section. No back crease is visible; the germ sculpture is two-fifths as long as the grain. It is a handsome, free stooling, prolific, hardy, mid-season wheat; is well known, and deservedly popular.

Blounts' Lambrigg.—This is a strong stooling wheat of medium height, or even rather tall, yielding well under proper treatment. The straw is strong, tough, stiff, hollow, of medium thickness, slightly tapering, and of medium flexibility. The joints are not prominent. The foliage is of medium abundance. The flag is erect, smooth, dark green, glaucous, and tough, rather narrow, and of medium length. The bald, square, erect regular heads are smooth and yellow, of medium length and compactness, uniform in diameter, or clubbed at the tip, often twisted, blunt at the tip, tapering at the base, where they present three to four sterile spikelets. The fertile spikelets are spreading and three-grained. The chaff is of dull uniform colour, somewhat angular-backed, deep, close lying, firmly attached, stiff and short, nearly acute, mucronate at the base of the ear, and short-awned at the tip. The grain is rather small and flat, of medium length, straight, plump, opaque, flat-bosomed, of a yellowish or amber colour, rather pointed at the base, blunt at the tip, and presents a small brush. The crease is deep, and a back crease is also visible. When cut, the sections appear mealy. The germ sculpture is large. The grain is of a fair milling quality. It is a late wheat and requires sowing early.

Improved Fife.—Below medium height, and, like all Fifes, late. The straw is yellow, at no time purple, dull in lustre, furrowed, of medium thickness, hollow, strong, stiff, and tapers but little. The rather scanty foliage is inclined to be erect, narrow, smooth, dark green, and glaucous. The ears are almost rosy, smooth, bald, of medium length, regular, a trifle open, tapering, flattened obversely, erect, straight, acute at the tip, tapering at the base, where there are three or four sterile spikelets. The spreading fertile spikelets contain three grains. The chaff is of medium length, dull, and uniform in colour, bluntly mucronate near the base of the ear, and short-awned above the middle of the ear, rather thin and soft, rather shallow, angular-backed, pretty firmly attached, and lying close to the grain. Little, if any, shelling occurs. The grain is small or of medium size, of medium length, straight, of medium plumpness, opaque, whitish or yellowish, plump-bosomed, blunt at the tip, rather pointed at the base, and has a deep crease, rather mealy cross-section, and an abundant brush. A back crease is rarely visible. The germ sculpture is two-fifths as long as the grain. A hardy rust-resistant, late sort, stools well, is fairly prolific, and yields a grain of good quality. It should be sown early.

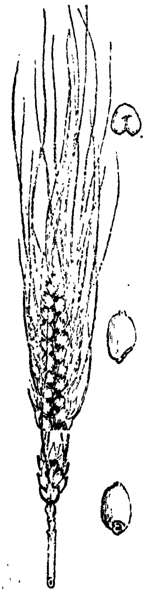
Allora Spring.—This variety is that sometimes referred to as "Ninety-day wheat" or "Three-months wheat," names which have also been applied to wheats of the "Velvet Pearl" type—in both cases on account of its extreme earliness. It is below the medium height, the dull yellow furrowed straw is fine, semi-solid, a little too weak and brittle to be desirable, but slightly tapering. The sheath of the topmost leaf extends less than half-way to the ear. The smooth, red, bald heads are of medium length, regular, open, tapering, square, erect, straight, acute at the tip, abrupt at the base, where there are one or two sterile spikelets. There are three grains in each of the spreading spikelets. The chaff is somewhat streaked with colour, dull in lustre, of medium length, blunt near the base of the ear, but short-awned a little higher up and long-awned at the top, of medium stiffness, shallow, almost angular-backed, rather loosely attached, and not lying very close to the grain, in consequence of which considerable shelling is likely to occur unless the grower is prompt and handy in harvesting. The grain is small or of medium size, short, straight, plump, opaque, whitish, flat-bosomed, blunt at the tip and also at the base, and has an abundant brush, a rather deep crease, and a mealy cross-section. A back crease is generally visible. The germ sculpture is two-fifths as long as the grain.

Medeah.—This is one of the solid strawed-bearded wheats, belonging to the species Tritirum durum. Like other durum wheats, it is a tall, rank-growing wheat and does not produce a stool with many stalks. Its straw is very strong, solid near the ear, of medium thickness, stiff, though it usually bends under the weight of the heads, very tough, dull yellow coloured, tapering; it is never purple; the sheath of the upper leaf reaches three-fifths the distance to the ear; the joints are prominent and brown; the large leaves are thin and drooping; the large flat ears are brown, glaucous, regular, and are made decidedly handsome by the long, straight dark-coloured beards; although only of medium length, the ears are so crowded with grain that they lean over on the stalk on account of their great weight. In form they are straight, of uniform size throughout, or slightly clubbed, and blunt at both ends. There is seldom more than one sterile spikelet at the base of the ear. The beards are coarse, orderly, brown or black, spreading or nearly parallel, of equal length, the lower being only a little shorter, and they often shell at maturity. The three to four grained spikelets are widely spread out in the form of a fan, and are free from down, except on the mid-ribs. The long, stiff, and thick chaff is very firmly attached and lies very close upon the grain, so there is no chance of the grain falling out and becoming lost. The chaff is angular-backed and deep, and of a streaky brown colour. Like other durum wheats, the Medeah has a large and long, often somewhat curved and rather thin grain. The grain, however, is often opaque and of a yellowish colour, instead of being horny and amber-coloured. It is pointed at both ends, presents a close and very deep crease, and even occasionally a faint back crease; the germ sculpture is very large and the cross-section horny. This wheat is a very prolific one, hardy, of medium earliness, and so resistant to rust that it can be grown in the coast districts; but it is not a very good milling quality, and, on account of the large beards, is not very suitable for hay. It is one of the best for macaroni making.



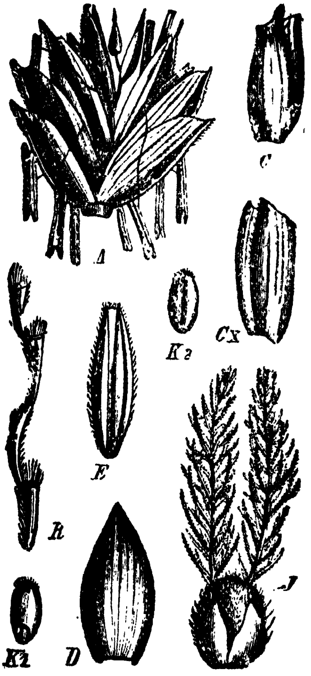
Belatourka.—This is a hard wheat from S. Europe. It is a very tall wheat, whose dullish yellow furrowed straw is solid or nearly so, of medium thickness and flexibility, strong, and tapers but little. The drooping light green foliage is rather scanty, considering the great size of the plants; the sheath of the uppermost leaf reaches less than half-way to the ear. The smooth light brown ears are bearded, regular, very compact, of uniform width, strongly flattened, leaning when ripe, blunt at both ends, and have only one or two sterile spikelets at the base. The fine brownish beards are long, very orderly in arrangement, parallel or nearly so, of equal length, and are rarely shed at maturity. The spreading spikelets contain three grains. The chaff is glaucous, dull, and uniform in colour, of medium length, rather bluntly mucronate, and, like that of all other hard or durum wheats, angular-backed, deep, firmly attached, and lying close upon the grain. Shelling never occurs under ordinary circumstances. The grain is large, long, straight, or slightly curved, of medium plumpness, opaque or horny according to season or locality, yellowish or amber-coloured, rather plump-bosomed, somewhat pointed at the tip and also at the base, and has a small brush, a rather mealy cross-section, the germ sculpture occupying only two-sevenths of its length. A back crease is not visible. Belatourka is a hardy, prolific, and rust-resistant mid-season variety, having many fine qualities. It is a strong bearded wheat and difficult to thresh, and is on that account of little use for hay.

Algerian is a very tall wheat, and has stiff, coarse, and tough solid straw, with large and prominent joints; in colour the straw is yellow. The ears are whitish, bearded, and smooth, long and large, regular, very compact, somewhat pyramidal, flattened, erect or leaning, straight or slightly curved, blunt at both ends, and presents only one or two sterile spikelets at the base. The beards are long, coarse, orderly in arrangement, whitish or brownish, parallel, and are often shed at maturity. Each spreading spikelet contains three grains. The chaff is rather short, somewhat blunt, not mucronate, softer than one would expect in an ear of such dimensions, almost shiny, very deep, the other being edged with brown or purple, angular-backed, firmly attached, and hugs the grain very closely and holds it well. The grain is large, of medium length, a trifle curved, very markedly hump-backed, and in consequence very unusually thick, very plump, opaque, yellowish, plump-bosomed, very blunt at the tip, rather blunt at the base, and has an abundant brush, a rather shallow and open crease, and a very mealy interior; no back crease is visible. The germ sculpture is one-third as long as the grain. This is a mid-season variety, adapted to poor soil and adverse conditions. It will yield something with little care, and on cold, wet soils where the drainage is poor, under circumstances



where most wheats will be a failure. It is resistant to rust, and is a very prolific sort; but the grain, though handsome, is of a poor milling quality. It succeeds in coast districts.

Cross-breeding of Wheat.—Wheat is a close fertilised plant, which means that each wheat plant contains all the elements necessary to reproduce its species, and uses them for its own purpose. Natural cross-fertilisation is almost unknown; owing to this fact it is possible to grow a large number of varieties of wheat in rows next to each other without any cross-fertilisation.



The illustration shows: A, spikelet, with stamens hanging down; C, empty glume; CX, empty glume with back view; K 1, seed; K 2, seed from the back; R, stem of the spike; E, flowering glume; D, outer glume; J, pistil.

It is therefore necessary, when it is desired to produce new varieties of wheat, that artificial fertilisation be resorted to. This is a simple operation, but requires a certain amount of care if the result is to be successful.

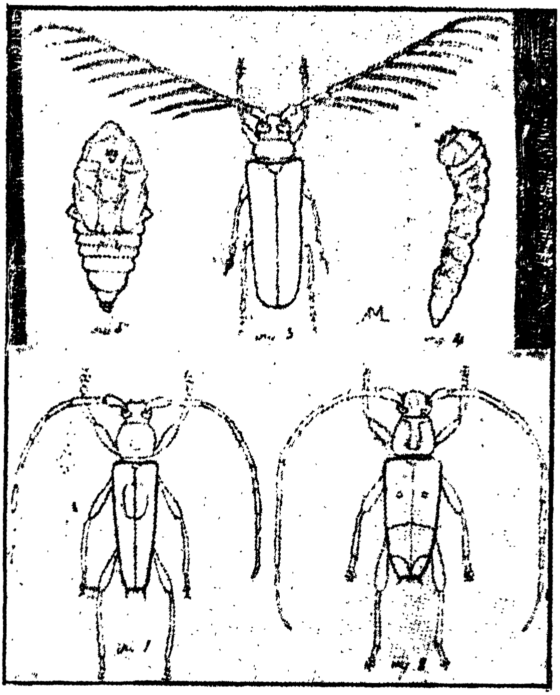
The operation is performed by selecting the heads of the varieties which it is desired to cross, and marking them by tying pieces of coloured cloth round the stem of the plant just below the head. It is then necessary to watch the heads until the flowers begin to break; as soon as the stamens can be seen, and before they have time to fall, they should be removed (by a small pair of tweezers made for the purpose) without injuring the plant. Then as soon as the pistil appears, the stamens are taken from the plant which it is desired to reproduce and placed so that they will fall on the pistil of the plant it is desired to fertilise; the head can then be bound up or covered with mosquito net, to prevent any accidental fertilisation of any flowers that may have missed, and the operation is complete. It is not to be expected that the operator will be successful at the first operation, but after a little practice he will soon become proficient.

After the cross-fertilisation has taken place, the fertilised heads will be marked; as, for instance, Steinwedel x King's Jubilee, it being always understood that the first name is the father and the latter the mother of the new variety. This also makes a considerable difference; Steinwedel x King's Jubilee, for instance, would probably give a different result to King's Jubilee x Steinwedel, and so with any other variety. The seed from this cross-fertilised head of wheat will be sown again the following season, but it is not to be expected that the resultant plants will all turn out the same; most likely several different varieties will be found growing from this one head, and especially if one of the varieties the cross was made from happens to be a bearded wheat, the resultant seed will probably give a number of plants ranging from bald to bearded. The new variety desired is only obtained from these by selecting the heads which correspond to the variety which it is desired to produce, and growing these again and destroying those which are not of the desired variety, and therefore it takes a considerable time before any quantity of seed of a new variety of wheat is available for use. The obtaining the first bushel of seed of a new fixed variety is the greatest trouble; after that the increase is rapid, and if the variety proves satisfactory the new variety is probably given a name and put on the market at an increased price by a progressive farmer or seed merchant. A good many crossbred wheats are often bred without getting a variety that is an improvement on the parent stocks.

TREE-BORER.

The following letter has been received by the Director of the Department of Agriculture from the Town Clerk, Kalgoorlie:—"I have this day forwarded to your Department, under separate cover, a box containing a specie of grub, or borer, which is causing great havoc to trees in this town, and would ask you to kindly inform me what the real name of it is and how to treat same. I have also forwarded a stem of a pepper tree, which is in a very bad state with these insects, for your inspection and report."

The entomologist of the Department being away, the grub and stem were forwarded to Mr. Lea, Government Entomologist of Tasmania, in reply to which Mr. Lea reports:—"The branch of eucalyptus from Kalgoorlie has been attacked by at least two distinct kinds of beetles, and the trees there are probably attacked by many others. Of the three grubs sent in the tube, two are Longicorn larvæ, belonging to the genus *Phoracantha*, the third is the larva of a Buprestid beetle, probably of the genus *Stigmodera*. In Perth I frequently noticed different species of eucalyptus trees in the streets that had been killed or seriously injured by longicorns, the principal ones being *Phoracantha recurva*, *P. semipunctata*, *P. senio*, *P. tricuspis*, and *Epithora dorsalis*. I do not believe that anything can be done at a reasonable expense to protect the trees against the attacks of these insects, which seldom attack thoroughly healthy trees; they attack trees growing under unhealthy conditions (as in streets) or which have been previously weakened by other insects, and they breed in enormous numbers in ring-barked and newly-felled timber. The perfect beetles fly at night time. As the conditions under which the trees are attacked are continuous, it would probably be advisable for the Kalgoorlie people to plant out trees of kinds which they find are not attacked. Probably most of the eucalyptus family would be so attacked."



In reference to this the Horticultural and Viticultural Expert, Mr. Despeissis says:—"On receipt of the stem of a young tree, said to be attacked by some insects, from the Coolgardie City Council, I found under the bark a number of larvæ of borers, which were living on the sap wood, making flat channels next to the bark, and almost girdling the tree. These larvæ have some likeness with the flat-headed apple tree-borer, known in America by entomologists as *Chrysobothris femorata Fabr.*, and I submitted them for identification to Mr. A. M. Lea, Government Entomologist, Tasmania. The last mail brought me the attached answer, which may prove interesting to the Coolgardie City Council. I would add that the beetles of this family make their appearance in the early summer, and are readily attracted by light, and on that account are likely to prove troublesome and destructive to gum trees planted in streets."

BEE INSPECTOR'S REPORT.

By J. Sutton.

The following report has been received by the Director of Agriculture from Mr. J. Sutton, the travelling expert to the Department:—At Mr. Ashworth's Apiary, Glenferrie, York, I found he had cleaned up his apiary and removed infected combs, frames, and hives as directed. His bees are still in a weak and poor condition, and after discussing with Mr. Ashworth as to what was best to be done, we decided to remove the good colonies to his home, about one mile distant, and leave the diseased colonies to winter in their old places. As there are not any other bees or apiaries within some miles I did not destroy them, as during the winter season it is not practicable to effectually remove the cause and wipe out the disease without killing the bees. While in the honey season, and when plenty of honey is coming in, by starving and other methods, foul brood can be effectually cured in a week, providing they have proper attention. The majority of his 30 swarms have chilled brood, but only three have developed foul brood in a bad form, these will remain and the others be moved.

Messrs. A. and S. Cook, Coondle, Newcastle district, have several out-apiaries, where they have 50 to 75 hives, from Coondle to Hoddy's Well, and are all in the pink of condition; all told they have 470 colonies, and have extracted about 25 tons of honey and some hundreds of section honey. They report the season being exceedingly dry. The district is certainly one of much promise as a honey-producing centre, except the drawback of dry seasons. Honey was coming in freely while I was inspecting, and the whole of the bees and hives had that healthy and happy appearance an apiary should always have.

Woorooloo.—Here the dry season has been more severely felt than in any other part of my travels. Mr. T. A. Illbury has 11 colonies in fairly good order, and during the season he has only taken 23 dozen 2lb. tins of honey. Mr. Wishart has four colonies, Mr. Stevenis three colonies. Neither of these have taken any surplus, using all that was gathered themselves. Messrs Richardson Brothers have about 60 colonies, and all told they have extracted about 35cwt. of honey; this certainly is much below the average of even their own district. Mr. W. J. Bottle had 125 colonies, spring count, but had reduced to 105 colonies; he had extracted only 30cwt. These bees on this same stand produced 10 tons of honey only three years ago. Prospects for next season are, however, encouraging.

Mr. C. Cook, Chidlow's Well, who has 90 colonies, has had a very poor season also, having produced about 30 to 35cwt. He reports that the season was so very dry that only with close attention were his stocks kept together and able to hold their own.

Mr. Ed. Byfield, Helena River, *via* Chidlow's Well, has 12 colonies that have, like their neighbours, only held their own during the season.

Mr. P. Pearson, of Beverley, reports that his 100 colonies have not kept themselves; neither honey or pollen available; the worst season he has experienced in his district.

Left Perth for Boyup Brook, arriving at Hester at 8 p.m., and drove in a trap to destination, arriving at 3.30 a.m.; spent the following day visiting the farms and farmers. Gave a lecture in the Boyup Brook School at 7 p.m., and while the room was crowded each seemed anxious to learn something of the very interesting bee and the production of honey, Many questions were asked and answered. As a dance was to follow, we had to give up the hall, only to find that those who were anxious for information kept us answering queries into the small hours next morning. I think the visit was very much appreciated, and will lead to improvement, so far as bee-keeping in the district is concerned. A. S. Cailitz has 20 colonies, and here we met a few settlers on Saturday morning, to whom was given an object lesson in going through the several colonies.

Bridgetown.—While honey in this district is good, those who have got a few bees, from inattention and neglect, are really doing more harm than good. Mr. J. Allnut has three hives, one of which has comb honey, but is full of ants that are at work removing honey and dead matter. The next hive is full of bee moth, and it will certainly bring the owner trouble unless the ants find it out and they remove dead and deceased matter. The next hive has a few bees, but is also full of the bee moth, and a disgrace to anyone keeping bees. This apiary must either be wiped out altogether, or cleaned up and kept in proper order. The owner was from home when I inspected; however, I met him and told him that he must destroy the lot.

Mr. J. E. Walters, Peninsula, has a nice lot of bees, and has had plenty of honey, but is waiting to get an extractor before they can be got in going order.

Mr. James Hastings, near Picton, has 14 colonies, in fairly good condition, but not too much honey; they, however, should give a good account during the next season as the district is full of promise.

For some time signs have appeared which indicate that foul brood, or some disease, exists within this district, and with the object of finding out I carefully visited the district from Picton and Bunbury, but only found one place where bees were kept, and here I had some difficulty, as they objected to allow me access to the hives. However, this made me the more determined, and on my producing my authority, and promising I would not harm their bees, I was graciously permitted to look. The weather, certainly, was not favourable to open and handle. However, I am quite satisfied there is something wrong which will have my attention as soon as weather and other circumstances permit of my going through them.

BEE NOTES.

By J. Sutton.

During this and next month wet weather will prevail. Nothing can be done to the inmates of the hive, but care should be taken to see that hives and boxes are snug and watertight. Many people cover with an old bag, no doubt with the very best intentions; but it must be obvious to anyone who will stop and think that, instead of being of service, this method only serves to keep the whole in a cold and sodden condition, seeing the over-hanging old bagging acts like a sponge. The heat of the cluster of bees draws the damp through, with the result that wet keeps dripping on to the bees within the hive, exposing them to chills and disease.

Even during a warm day it is unwise to disturb the colony; but better to risk this than to leave hives in the state mentioned above.

Now is the time when new hives should be got ready, fitted, and painted, that they may be handy so soon as the swarming season arrives. Those who wish to make their own hives will find the Langstroth size the most useful, and herewith is given dimensions of same:—Inside measurements: length, $18\frac{1}{4}$ inches; depth, $9\frac{1}{2}$ inches; and any width, to take 8, 10, 12, or any number of frames, at the discretion of the apiarist. The 8-frame hive is handy, and for a starter all that may be desired; the end boards are rabeted down $\frac{13}{16}$ x $\frac{7}{16}$ inch; on this is nailed a strip of folded tin, on which rests the frame, and leaving on the top side of frame a bee space of $\frac{1}{4}$ inch. Dimensions of frames are: top bar, $18\frac{3}{4}$ inches long; bottom pieces, $17\frac{3}{4}$ inches long; ends, $8\frac{1}{8}$ inches, and of various widths. The one I would certainly recommend is the Root-Roffman Frame, which is so constructed that a bee space is always exactly the same when the frames are crowded together, as in the brood nest they always ought to be. In comparing these sizes you will find that the bottom of frames are within $\frac{1}{8}$ inch of the bottom of hive, and to get a bee space a $\frac{3}{8}$-inch piece of strip $\frac{7}{8}$ inch wide is tacked on the bottom board.

The idea of cutting out a piece in front of hive, about 3 inches wide and $\frac{1}{2}$ inch deep, has long since been demonstrated as out of date. With the hive as given above everything is interchangeable; at any moment you can remove a frame from one to the other, or can take a super from one hive and place it on its neighbour, without any bother of fitting.

For extracted honey it is best to use a honey board, which is to keep the queen and all her young brood always in the bottom box or hive, placing a second body on top (this is called a super); and once your bees are strong and will fill the two bodies, they will commence to store honey in the super, which, when full, can be replaced with an empty one while the one removed is being extracted. For section honey a half-body or half-super is used, in which the section boxes are fitted, and placed as above directly on top of the one in which your queen and young are working.

After all, it is a matter of indifference to the bees as to what sort or size of hive you place them in, so long as the hive is strong, sound, and well fitted together; but the convenience in handling makes all the difference. Being interchangeable in all its parts reduces, to a very large extent, the work of the apiarist when he has a hundred or more colonies to care for, and more especially when honey commences to come in in large quantities.

When handling honey, extracting, and getting ready for market, give me the "Dovetail-Langstroth" hive, and let me have it two or three stories high, so that the bees can fill the frames and cap it over before it is removed for extracting; then your honey may at once be strained and put into tins ready for market without fear of it going bad, as unripe honey certainly will, if tinned and sealed before maturing. Unripe honey will candy sooner than ripe honey during a cold spell in the weather.

Besides the hive referred to above, there are others that have taken a good position in America. viz., the "Heddon" hive, of the same dimensions, except the frames are about half the depth of the "Langstroth," and are close fitting at the ends; then the "Quinby" hive is nearly of the same inside measurements, only this has closed end frames; and lately, the "Danzen Baker," or "Danzy" hive, has been introduced, and is coming to the front. Each have some special points peculiar to themselves, none of which, to my mind, compare favourably with my choice—the "Root's Hive."

Should any colony be found to be short of stores, a little warm syrup given at the entrance (using the Boardman feeder) in the evenings will help very much to carry the colony safely through the cold weather.

Be sure your hives are water-tight; and also see that the back of the hive is a little higher than the front. Old bottom boards, that have been made quite secure by the bees from draughts, are sometimes a detriment when the bottoms hold water that drifts inside during a shower. By keeping the front a little lower than the back, this annoyance will be prevented.

POULTRY NOTES.

Egg-laying competitions are becoming very numerous of late, and Australia, in particular, is paying great attention to this form of poultryism, if I may coin such a term; but too much value should not be placed on the results, as, something like the fortune-tellers, they each tell a different tale. The English Utility Poultry Club's competition, the results of which appeared in last month's issue, gave White Wyandottes as the winners, and Buff Orpingtons as 2nd, 3rd, 4th, and 8th. White Wyandottes were also 7th, 9th, and 11th. There were 24 competitors, and the contest was during the coldest 16 weeks of the year. The conclusion come to is that these two varieties were the most successful at this particular contest; it proves but little else. Because Silver Wyandottes are all low down, occupying positions Nos. 15, 16, 18, and 20, it does not necessarily follow that as a breed they are proportionately inferior layers to the Buff Orpingtons and White Wyandottes. There are so many things to consider, such as age, the temperament of the various birds, their mode of living prior to entering the competition, and, last of all, the important one of strain. There are good, bad, and indifferent laying strains of all the laying breeds, and among the table varieties some can be fairly described as layers—bad, worse, and worst. Some hens, and not particularly old ones either, although fine big birds, and good-looking enough to win prizes at shows, are frequently met with which do not lay at all, thus fully justifying their position as bad layers in the superlative degree. The New South Wales laying competition of 12 months' duration, the results of which are re-printed in this issue, give interesting reading, and here again inconsistency is strongly in evidence. For instance, single-comb White Leghorns came second in number of eggs laid, other pens of the same breed occupying positions as follows, viz., 20th, 24th, and 29th. Then take Silver Wyandottes. They occupy positions near the top, viz., 4th and 5th, but they also occupy places well down the list, viz., 25th and 28th. Minorcas are noticed right at the bottom in both competitions. Now, it is a well-known fact that Minorcas are splendid layers, therefore one is forced to conclude that all the Minorcas competing were not of good laying strains. Golden Wyandottes are anything but prominent in both competitions, yet wonderful layers of this breed are known to exist, and bad ones few and far between. Individual poultry keepers find the same differences from their own experiences. One person will say the best layers are Buff Orpingtons, whilst another breeder of the same variety has found his results to be very unsatisfactory. The discrepancies are due either to strain or personal attention, in most cases the former. The probabilities are that the owners of the various pens occupying prominent positions belong to persons who have paid attention to the egg-laying qualities of their fowls by careful breeding, whilst those low down on the list have studied breed more than strain. The New South

Wales people are to be congratulated on the success of this, their first competition, which, as looked upon as an advertisement, must be considered a splendid one, as a means of drawing public attention to the poultry industry; and, with the continuance of such competitions, breeders will be spurred on to increased efforts by careful breeding to produce stock that will, year by year, gradually increase in productiveness, until the average of the late competition of 129 eggs for the 12 months will be greatly increased; until averages of 200 eggs per hen per annum and even over will be attained, and by many competitions. The evident result will be that the demand by the public for eggs for setting from proved prolific layers will be very great; and, as the stock gets distributed over the country, the surest means is thus attained of obtaining a general increase in egg-production.

THE STATE POULTRY FARM.

The State Poultry Farm at Narrogin is now stocked with good specimens of pure-bred poultry, the greatest care having been exercised in selecting the stock to have only strong, vigorous birds and of good laying strains. All the poultry have been purchased in this State, and are therefore quite acclimatised; in fact most of them are locally bred. The breeding runs are large, viz., 36ft. x 60ft.; the houses are of iron, airy, and well ventilated. The following varieties are there, viz.:—Three laying varieties by Minorcas, Brown Leghorns, White Leghorns; three general purpose breeds, viz., Plymouth Rocks, Golden Wyandottes, and Black Orpingtons. Table (Indian Game): Crossbred Indian Game Cockerel, with Silver Dorking and Buff Orpington hens. Ducks: Indian Runners and Pekins. Orders may now be booked for eggs from any of the above fowls, which will shortly be for sale at 12s. 6d. per dozen, including railage. Special boxes have been made so that the eggs can be packed so carefully that they will stand any ordinary treatment without fear of breakage, and as the boxes are very plainly marked in large red letters, "Valuable eggs with care," it is hoped that the officials of the Railway Department will assist this department in using their best endeavours to convey the eggs to their destination in good order.

As the demand for eggs is very great, it is advisable to send in applications early, and they will be supplied in order of application. In addition to selling eggs for setting purposes, it is intended to breed poultry to dispose of next season to farmers and settlers requiring pure-bred fowls.

HATCHING NOTES.

Most poultry keepers know how to set eggs under a hen, but are frequently at a loss to account for the whole or partial failure of the hatching results. There are many reasons for such; some of them on account of the stock being too closely related, or too old a male bird; hens too fat, or breeding pens of too small dimensions. The best results are obtained if the fowls have quite unlimited run. Eggs from such stock, provided they are strong and healthy, invariably give satisfactory results. Even when a good percentage of chickens have been hatched, great losses are made in the rearing owing to wrong treatment. For at least the first 24 hours no feed is required, except by the hen, which, as a rule, is then very hungry. Whole maize is good, it being too large for the chickens to attempt to eat; also if given a drink of water she remains contentedly on the nest until the little chickens are ready for their first feed, which generally consists of hard-boiled egg and bread crumbs, but it is not necessary to cook the egg; but if mixed up raw with bread to a dry crumbly condition will do. Very young chickens should not be given whole grain. In about a fortnight's time cracked wheat may be given. Soft food, such as bran and pollard, should not be mixed at all sticky, and only given in such quantities as will be eaten clean up, as it soon becomes sour. Young chicks must be fed little and often. About the safest and best feeds are crushed grain, both wheat and oats; not crushed oats, such as are given to horses, but properly crushed, so that the kernel is separated from the husk. Handy little machines, specially made for this purpose, are on sale at the principal ironmongers. Fine sharp grit is necessary; any ordinary gravel can be reduced to the correct size by putting it through the above-mentioned mill. Clean water only must be supplied. A handy and simple vessel is a flat fish tin; remove the top entirely, fill with water, and cover with a brick or solid piece of wood all but space sufficient for the chicks to drink; this cannot be upset, and is easily cleaned out, which should be done at least once a day. A little animal food is much liked and necessary to send chickens along well, also unlimited green feed—the run of plot of growing greenstuff is best of all. The hen is better not to have access to the plot if it is of small size, as she would soon scratch the life out of the plants. The hen can be kept in a coop or small run, giving the chickens exit through small openings to the greenstuff; they should thrive well, provided they get nothing but clean food and water, and kept free of lice, both in the hen and coop. It is not good to let the hen and chickens remain at night time either on the damp ground or on hard boards. A simple plan is to lay an old sack well covered with fine dry sand, and thoroughly clean it every day. It is not wise to keep the same sack too long in use, as it is liable to get foul-smelling and breed red mites. In two or three weeks' time the chickens will be strong enough to run with the mother, and if given free range in orchard or among stable manure they require but little food, and thrive amazingly; but if such conditions are not available, three or four hens and their chickens can be kept in an enclosed run of, say, 30ft. x 30ft., but care must be exercised in feeding to scatter it in different directions, to avoid quarrelling among the different hens. As the chickens receive generous feeding under this system, the hens also participate, and are thus forced on and quickly start laying again, when, of course, they are taken out of the chicken run. Feed the chickens well all the time with plenty of greenstuff, and two or three times a week fresh-cut raw bone is splendid food; it is much relished, forms bone and stamina, and produces early laying.

BITTER PIT AND THE CLEOPATRA APPLE.

The following correspondence was received from Mr. J. N. Cox, of Athgavan, Coolup, under date 18th March, 1903:—

"I write to request that you will lend me a gas-tight tent for a fortnight, large enough to enclose 30 or 40 fruit cases. I wish to confirm the result of an experiment accidentally tried by me three or four years ago, and which, if successful, will be of great importance to all fruitgrowers. On the occasion referred to, I mistook the marks on Cleopatra apples, caused by bitter pit, for the effects of San José scale; and as I wanted to keep the fruit for my own use, I fumigated it with hydrocyanic gas. I am of opinion that this treatment, without injuring the apples, completely arrested the spread of the bitter pit, and the apples kept until we used them. This year I have about 200 cases Cleopatras, of which about one-third or two-fifths are blemished. This means that the whole crop will become blemished soon after picking if the disease is not arrested. I propose to fumigate the lot.

"Although, perhaps, I ought to make this subject matter for a second letter, yet it is hardly out of place as a corollary to the first portion. I want to draw your attention to the prevalence in this neighbourhood of fungus pests among apples; and to the fact that apples so infected are absolutely worthless for export to London. Also to the fact that in this neighbourhood all Cleopatras are so infected with bitter pit as to be useless for export. I seldom go from home, but my own apples, in spite of reasonable treatment in the matter of spraying, cannot be stored without developing bitter pit in Cleopatra and Jonathan, and anthracnose in Jonathan. The same applies to many of my neighbouring orchardists with whom I have conversed on this subject. I selected about 20 Jonathans with a view to showing them at Pinjarra Show, and put them away on a shelf by themselves to ripen. Of course, when picked they appeared to a critical eye to be perfectly sound; yet in about 10 days there was not one which had not a spot or two on it. I do not know whether the spot was anthracnose or bitter pit. I fancy it was the former. You must recognise the importance to the district of this. Men have planted orchards entirely with a view to exporting to England, and, if my conclusions are correct, their apples will not be fit for export. Moreover, I find that everybody who has had local experience of Cleopatras has found that they, more than any other variety, are subject to bitter pit; and yet three people this year have planted that variety with a view to export, influenced by your advice. And the department lends publicity in the *Journal* to Mr. Price's statement that he values Cleopatra first for export, and there is no second. Now, I have got about three tons of Cleopatras this year from 30 ten-year-old trees, and my candid opinion is that for export purposes they are not worth one penny per hundred tons. I should expect to find the whole consignment unsaleable on arrival at its destination. Last year I sorted the unblemished fruit extremely carefully and isolated them from the blemished one; yet in a fortnight I found that a large number of the isolated fruit had developed pits. I am in hopes that the experiment which I propose to try will enable me to store my fruit; otherwise it will have to be sold immediately. The remarks which I have made about my Jonathans must not be taken as condemnatory of that apple. My few trees were planted on a stiff clay bank, which I judged to be actually unfit for anything; but I thought that apples would struggle in the situation better than anything else."

On receipt of this letter, Mr. Despeissis arranged with Mr. Cox for a case of his Cleopatra apples to be sent up to the Department of Agriculture, in order to try the effect of several washes and dips in checking the disease.

Since then, the Department has been in receipt of a further communication from Mr. Cox, as follows:—"I write to give an account of the experiment which I made of cyaniding Cleopatra apples to arrest the spread of 'Bitter Pit.' Having selected all unblemished apples, I fumigated them for an hour with the usual proportions of the gas. Upon opening them up after six weeks I find that the process has had no effect in arresting the development of the fungus. I also fumigated one case of slightly-blemished apples; this case deteriorated as much as if it had not been treated. One case of clean apples was purposely put away without fumigation, and I could detect no difference between it and the fumigated ones. One case of blemished apples, packed in a case lined with paper so as to render it comparatively air-tight, contained very fair apples. They were nicely ripened, and the spot had developed very much less than in open cases. This seems to point to the fact that protection from the air helps to preserve them. Next year I propose to test this idea by putting some cases of apples away, each apple packed separately in paper. Perhaps you could obtain information from Eastern packers on this point. The drawback to this method is: it is necessary to pick over the fruit occasionally, as a crop does not ripen evenly. Some apples in a case will ripen and rot before half the others show a sign of yellow. If wrapped in paper, this process would be impracticable. Hoping that you will find some solution of the difficulty."

In the meantime the Cleopatra apples sent by Mr. Cox, which were treated differently on the 8th April, were kept under observation.

They were divided into four lots:—

1. Witness not treated.
2. Dipped for $\frac{1}{2}$-hour in a 4 per cent. solution of Formaline.
3. Dipped for $\frac{1}{2}$-hour in a solution of Spirits of Wine at 32° O.P.
4. Dipped for $\frac{1}{4}$-hour in a 3 per cent. dip of Bordeaux mixture.

These apples were kept under observation all the time, and to-day, 8th of June, after two months:

No. 1. Shows no sign of "Bitter Pit"; all the apples are sound.

No. 2. Shows no sign of "Bitter Pit," but 25 per cent. of the apples are rotten, having, presumably, been affected by the strength of the dip.

No. 3. Shows no sign of "Bitter Pit," but shows 10 per cent. rot.

No. 4. Shows no sign of "Bitter Pit"; all the apples are sound.

These experiments are mainly negative, for the reason that the fruit operated upon, which was supposed to be doomed to the ravages of "Bitter Pit," are free from that disease. It, however, confirms previous researches, which tend to show that nothing yet is known concerning the cause of the trouble.

After several observations under the microscope, I have not been able to detect the presence of any fungus in affected fruit.

In order to throw on this subject as much light as I can, I will quote the opinions of experienced plant pathologists:—

Dr. N. A. Cobb, Government Pathologist, New South Wales, writing about the "Bitter Pit" says:—"I have seen no evidence that would prove the disease to be caused by a fungus. No remedy can be proposed beyond avoidance of the sorts liable to the disease. Good keeping apples, as a rule, are not attacked. If a tree showed this disease badly, two seasons in succession, I would advise removing it, for, according to my observations, the disease continues from year to year in the same tree. The disease seems to me like one connected with the wood, and not very contagious. The young spots on red and yellow apples are hard, green, and sunken. Apples attacked by 'Bitter Pit' have poor flavour, and do not keep well."

Dr. Cobb's recommendation regarding removing trees showing signs of the disease two years in succession, is certainly sweeping, considering how little we know yet of the cause of "Bitter Pit." In fact, the teaching of the experiment referred to, points out that fruit from trees generally affected by the "Bitter Pit" may, and do in certain seasons, fail to become pitted, and it is not unlikely that, under improved methods of cultivation, it would become an easy matter to check the trouble.

The Rev. Edw. H. Thompson, when Scientific Adviser to the Council of Agriculture, Tasmania, says:—"This disease is quite distinct from 'Bitter Rot,' and the fruit attacked shrivels up, but does not rot. The surface of the fruit is pitted all over, and under these pits or spots the flesh is found to be brown, and dried up into a kind of cork-like substance. These spots are intensely bitter, and the fruit affected by this disease is altogether unsaleable." The writer suggests collecting and destroying all diseased fruit.

Mr. D. McAlpine, Government Vegetable Pathologist of Victoria, who has the disease under observation, is carrying out in South Gippsland a series of experiments "to enlighten us as to the conditions favourable or the reverse to the development of the 'Bitter Pit.'"

So far, the results of these experiments which was meant to determine the effect of different kinds of manures on the trees producing fruit affected with the disease, have, in the main, been negative.

"If they show anything at all," says Mr. McAlpine, "it is that the stimulating effect of the manure, at least in a moist spring and in young trees, has a decidedly injurious effect on the fruit. This is quite in keeping with the established fact that fruit from young and vigorous trees does not keep so well as that from more mature specimens. There is just a possibility of mitigating the 'Crinkle,' and, perhaps, too, the 'Bitter Pit,' as both these diseases are due to what may be termed disordered nutrition, by the use of potash manure alone or in combination with lime or with gypsum, and these will be tried in the coming season."

One fact must not be allowed to pass unchallenged in Mr. Cox's letter, and that is one regarding the value of the Cleopatra apple for the oversea export trade or for long keeping. It is true that Mr. Cox qualifies his remarks by referring to the Cleopatra in his own neighbourhood, and here seems to lie the gist of the question. The Cleopatra and those apples inclined to show the "Bitter Pit" appear to be particularly affected by lack of deep drainage.

In Tasmania, New South Wales, Victoria, or with us in Western Australia this fact has been well established.

The Cleopatra, nevertheless, stands foremost amongst the export and long-keeping varieties suitable for the conditions of soil and climate which prevail with us.

The trees are, on the average, sturdier and more fruitful, whilst the price obtained for the fruit in England is on a par with the highest price obtained by the best-favoured sorts. For these reasons I am still of opinion that, considered as an early-bearing tree, uniformly fruitful every season, one adapted to a great range of climate and soil, and producing a good keeping fruit, which has become sufficiently well known to always sell at a good price, the Cleopatra has few rivals.

It is, however, unsuited for those soils which retain an excess of moisture until late through the spring, although even in such soils it is reasonable to assume that deep drainage, liming, and judicious feeding up of the trees would do more for mitigating the losses occasioned by the "Bitter Pit" trouble than the sprays and washes.

We shall be glad to receive on this matter the experience of growers who may help to throw light on this disease.

PARASITES ON BLACK SCALE.

AN INTERESTING LETTER.

The following letter from Mr. O'Rath, of the Harvey, has been received by the Director of Agriculture, which must be gratifying to those that take an interest in the extermination of our orchard insect pests :—" Will you please let me have some ladybirds predacius on the red mite as soon as possible, as I see you have been successful in introducing them. You may scratch my name off the application list for insects feeding on black scale, as my ladybirds have completely cleaned them out. I can offer you plenty of these black scale-eating ladybirds in exchange for the red mite-eating ladybirds, for which I have plenty of food. I received about 30 or 40 of my ladybirds from Mr. E. M. Clarke last winter. They have increased to thousands this summer and cleaned five acres of oranges and lemons."

MACKIE'S PATENT ROCK AND WATER BORER.

The following description of a water borer, which should prove a most useful adjunct to every farmer, appeared in a recent issue of the *Queensland Mining Journal* :—

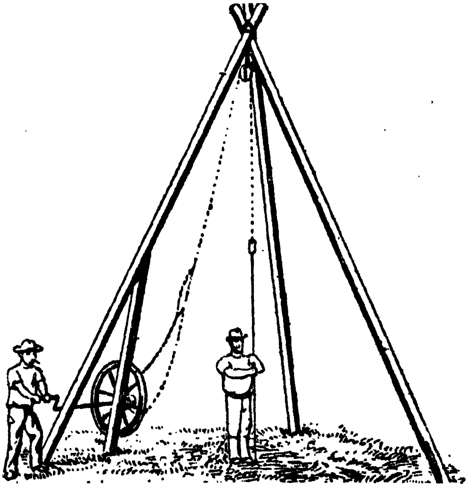


FIG. 1..

An appliance which deservedly attracted a good deal of attention at the Brisbane Exhibition last month was Mackie's patent hand-boring plant, exhibited by the Queensland agents, Messrs. Clark & Fauset, of Eagle Street, Brisbane. What struck everybody who examined this contrivance was its extreme simplicity. As shown by Fig. 1, the machine is worked by means of three wooden sheer-legs, 20 feet high, set up in the form of a triangle. The patent, however, consists in the wheel and cone, whose mechanism is shown in Fig. 2. The action is as follows:—A man working the handle revolves the wheel, and by this means the lifting chain which raises the rod is wound round a cone, from which the chain is automatically thrown off at a given point by the diagonal arm shown in the sketch. The winding process, of course, lifts the rod, which descends suddenly each time the chain is thrown off the cone, so that by the regular working of the wheel the rod is constantly being raised and suddenly dropped. The drop of the rod can be varied from two inches to 22 inches. When it is desired to remove the rod from the bore, the chain is fastened to the spindle, which then forms a winch, by means of which the rod can be either raised or lowered.

It is claimed for the appliance that with its aid one man can bore to a depth of 100 feet; that it can be easily worked by two men; that it can be erected in five minutes; and that it is capable of drilling at the rate of one foot per hour through bluestone. [We understand that the above can be purchased in Brisbane for £22, f.o.b.—Ed. *Journal.*]

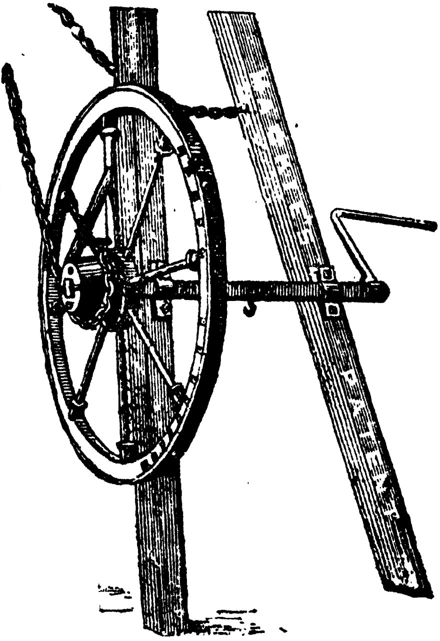


FIG. 2.

SAN JOSE SCALE.

By T. Hooper.

Now that the winter has commenced, it behoves growers to treat their trees for scale insects, especially the San José scale, which is grey in colour and very small, the same shape as the ordinary red orange scale, only smaller. It has never been known to attack citron trees in this State, so that it is only deciduous trees that need be examined. Owing to the limited staff of inspectors, it is impossible to visit all orchards each season. Those known to be infested will be visited, and as far as possible orchards not yet visited will be inspected. Should orchardists think they have any San José scale, specimens sent to the Department of Agriculture will determine; and if found to be the San José or other serious scale, an inspector will be sent to show the orchardist how to fumigate the trees so as to get rid of the pest. Tents may now be hired from the department, for which a charge of 2s. 6d. per week or part of a week will be made, and any damage to the tent will be charged up to the person who hired it. As the supply of tents is limited, those orchardists who can afford it are recommended to get tents of their own.

INDIAN ORANGES.

By the s.s. *Cooeyanna* the Department of Agriculture has received from the Superintendent Royal Botanic Garden, Calcutta, a Wardian case containing a few plants of two Indian oranges of great local reputation, viz., The "Mussembi" and the "Keonla," a short description of which we published in Vol. IV. of this *Journal*, p. 403.

These descriptions run as follow:—

> The "Keonla," greatly recommended on account of its lateness. Long after the oranges have been gathered the "Keonla" hangs on the tree, when it turns a beautiful dark red colour, and only then becomes sweet.
>
> The "Mussembi," brought from Poona and sold in Bombay It is said it can be left to hang on the tree for a whole year without hardly deteriorating. The fruit is orange yellow, and shows longitudinal furrows from stalk to eye.

These plants will be reared with care, and when they fruit will be propagated, should they be deemed of sufficient value.

This is the third consignment of plants received by the Department from India.

EGG-LAYING COMPETITION.

The first annual laying competition, organised by the *Daily Telegraph*, and conducted at the Hawkesbury Agricultural College by Mr. D. S. Thompson, Government Poultry Expert, terminated last Tuesday.

The object of the promoters was to stimulate the systematic breeding of higher standard egg-producing fowls, and results in this respect have exceeded all anticipations. The returns show how very far even many of the leading breeders are behind the best in the State. The average or the best results are not set up as the maximum to be aimed at—far from it, for it is hoped that each year these competitions are continued careful selection and breeding will be reflected in better and better egg yields, and that the average egg production of the State will improve correspondingly.

The first six months' contest closed on September 30th of last year, a report of which appeared in November issue of the *Journal*. At that, Mr. M. Ward scored first place with a pen of Black Orpingtons: in the final he came third; Grantham Poultry Farm, which was third in the first six months, coming first in the final.

In addition to the £31 paid at the end of the first six months, the following prizes have been won:—Greatest number of eggs in the year: Grantham Poultry Farm, first, £4; G. Kennedy, second, £3; M. Ward, third, £2; A. E. Henry, fourth, £1. Greatest number of eggs for the second six months: Grantham Poultry Farm (643), first, £4; G. Kennedy (572), second, £2; Dr. Fiaschi (546), third, £1 10s.; Mrs. A. Hislop (513), fourth, £1; A. E. Henry (501), fifth, 10s. The total winnings were as follow:—M. Ward, £15; Grantham Poultry Farm, £12; A. E. Henry, £8 10s.; G. Kennedy, £8; Bosanquet Bros., £2; W. H. Tombs, £2; Dr. Fiaschi, £1 10s.; Mrs. A. Hislop, £1.

Mr. Thompson reports:—"It can justly be claimed for this competition that it was the largest ever held in the world, and the first public test of a year's duration. It has exceeded the anticipations of everyone connected with it, especially in the interest it has created throughout the world. Everybody who cares to take an interest in it can learn many lessons from it—thousands are doing so. Many lessons have been gained at the college, where those associated with the test have not been slow to learn; yet there is much more to learn. The pens have been improved, the system of feeding has been improved, and the method of dealing with broody hens has been improved. During the currency of the second competition everything will be done to educate visitors, while we ourselves are diligently profiting by the lessons to be gained from it.

"The pens are still well grassed, and in splendid order. Throughout the competition no case of infectious or contagious disease occurred, and the hens will all be returned in excellent health, although many of them are heavily in moult.

"While the conditions under which the competition was conducted can still be improved upon in many ways to bring out the maximum of results, the test has demonstrated that poultry farming, and more particularly egg farming, will pay. We are able to give details of the laying of almost every appreciated variety of the day, with the cost of food and other necessaries charged against them, and the market value of the eggs, showing the profit which can absolutely be obtained from poultry farming reasonably conducted.

"The monthly laying was:—April, 728; May, 1,052; June, 1,524; July, 2,608; August, 3,097; September, 4,043; October, 3,713; November, 3,213; December, 2,942; January, 2,993; February, 1,774; March, 1,938: Grand total, 29,627.

"The food consisted of bran and pollard mash, mixed with liver soup in the morning, green food at midday, and maize and wheat alternately at night. The total cost of staple foods for the year was: Pollard, bran, and grain, £59 13s. 4d.; meat, £7 16s.; grit, 17s. 6d.; total, £68 6s. 10d. The market value of the eggs laid was £176 9s. 6d., thus showing a profit of £108 2s. 8d. The average value of the eggs was 15s. 6d. per hen, and the cost of feeding 6s., leaving a profit of 9s. 6d. each.

"The average results of the various breeds were:—

6	Imperials	... 880 eggs,	averaging	146·66
30	White Leghorns	... 4,376 eggs	„	145·86
41	Black Orpingtons	... 6,842 eggs	„	142·54
24	Silver Wyandottes	... 3,421 eggs	„	142·54
12	Buff Wyandottes	... 1,631 eggs	„	135·92
6	Birrilees	... 810 eggs	„	135·00
24	Buff Orpingtons...	... 3,227 eggs	„	134·45
6	Golden Wyandottes	... 753 eggs	„	125·50
18	White Wyandottes	... 2,040 eggs	„	113·33
12	Buff Leghorns ...	... 1,342 eggs	„	111·83
6	White Orpingtons	... 670 eggs	„	111·66
12	Andalusians ...	... 1,338 eggs	„	111·50
12	Anconas	... 1,308 eggs	„	109·00
12	Minorcas	... 989 eggs	„	82·41
228	hens totalled ...	... 29,627 eggs	„	129·94

"These averages can be read as a good criterion of what the various breeds can do as layers. The conditions governing the completion were not such as would produce data that the world could be asked to accept as final—so far as our State is concerned. Yet there is no doubt that even now the data can be accepted as a first-class guide to the farmer who is seeking for the solution of the problem of which breed will give him the greatest return in value. There is no necessity to publish theoretical or problematical assertions of what breeds can lay. There has been too much of that in the past. All interested can be left to study the details and draw their own conclusions."

The appended table gives full details of the laying and the value of eggs from each pen of six birds. The value has been calculated on the basis of the eggs laid each week and the prices obtained for best new-laid eggs at the auction sales in Sydney each Friday. The age given is the average of the six birds at the commencement of the competition:—

Owner, Address, and Breed.	Age—Months.	Eggs laid.													
		April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Totals.	Market Value.
Grantham Poultry Farm: White Leghorns	8	58	69	49	56	102	136	137	106	105	97	96	102	1113	140/3
G. Kennedy, Picton: White Leghorns	13	45	36	60	100	107	121	123	102	112	102	68	65	1041	126/2
M. Ward, Gosford: Black Orpingtons	7½	24	82	85	124	118	115	84	81	73	73	75	92	1026	131/
A. E. Henry, Ryde: Silver Wyandottes	11	31	74	101	106	100	107	93	78	94	106	61	69	1020	128/6
J. F. Brown, Summer Hill: Silver Wyandottes	10	31	59	66	82	104	101	101	97	75	96	69	64	945	117/9
Mrs. G. D. Cheshire, Tempe: Black Orpingtons	7	29	36	69	117	99	81	87	81	83	90	52	92	916	116/6
Mrs. H. Bastin, Enfield: Black Orpingtons	17	32	30	85	105	50	128	96	105	86	77	80	38	912	112/9
J. E. Pemell, Randwick: Buff Wyandottes	10	25	38	51	78	107	119	87	76	62	79	81	86	889	108/9
Bosanquet Bros., Liverpool: Buff Orpingtons	18	58	44	52	108	98	91	73	76	76	75	56	74	881	111/7
W. E. Boutcher, Canterbury: Imperials...	6½	27	84	49	74	116	76	71	79	95	80	64	65	880	112/2
E. H. Maxwell, East Hills: Black Orpingtons	7	17	42	88	67	81	99	114	84	81	84	39	72	868	107/2
F. Greenwell, Mittagong: Buff Orpingtons	11	27	38	49	102	90	108	79	83	75	76	64	75	866	107/4
E. Waldron, Willoughby: Black Orpingtons	7½	17	67	66	81	97	114	95	94	70	58	50	54	863	107/6
J. J. Roche, Bay View: Black Orpingtons	9	2	23	59	110	103	111	93	81	74	85	42	52	835	102/2
D. Scott, Birrilee: Birrilees	7½	0	18	34	54	81	130	129	103	119	96	34	12	810	89/7
Dr. Fiaschi, Sackville: Black Orpingtons	6½	0	0	0	71	68	119	120	106	101	98	59	62	804	89/6
A. Munro, Rockdale: Buff Leghorns	11	17	18	26	67	80	98	113	96	115	85	47	42	804	92/7
A. E. Scarr, Chatswood: White Wyandottes	8	44	52	44	56	80	101	83	77	74	67	54	71	803	101/1
J. D. Callaghan, Homebush: Buff Orpingtons	12½	41	5	40	80	110	106	85	70	73	64	41	72	787	93/7
W. Haydon, Hurstville: White Leghorns	7	7	17	22	83	70	94	124	115	90	83	45	24	774	89/1
W. F. Evenden, Kogarah: Andalusians	26	1	0	21	66	68	122	121	99	77	99	45	49	768	86/2
W. H. Tombs, Penrith: Anconas	12	18	66	80	72	105	103	88	67	60	40	10	48	757	94/9
A. Hallen, Toongabbie: Golden Wyandottes	7	12	0	38	53	100	114	85	80	80	75	39	77	753	88/10
Mrs. A. Hislop, Plumpton: White Leghorns	19	3	0	0	3	103	121	126	99	82	111	50	36	743	80/8
H. J. Braithwaite, Luddenham: Silver Wyandottes	7	60	53	87	75	53	66	72	60	69	63	43	41	742	97/1
W. H. Peters, Islington: Buff Wyandottes	6½	1	0	22	94	107	108	96	84	59	78	41	52	742	84/6
W. B. Bull, Summer Hill: White Wyandottes	12	21	10	3	56	52	129	101	109	62	51	56	65	715	82/4
J. Young, Burwood: Silver Wyandottes..	19	9	12	35	79	84	106	93	56	83	72	34	51	714	83/3
C. K. Horwood, Wagga: White Leghorns	7	11	20	23	47	71	112	101	76	60	118	46	20	705	80/5
H. E. Kelly, Ashfield: Buff Orpingtons	6	14	13	53	99	64	85	85	72	66	60	43	39	693	83/
S. G Small, Marsfield: White Orpingtons	10	2	2	19	61	73	116	94	83	64	94	31	31	670	74/8
L. L. Ramsay, Carlingford: Black Orpingtons	17	18	8	5	47	61	77	102	86	85	61	43	25	618	69/5
Mrs. J. Burke, Singleton: Andalusians	5½	0	0	7	30	30	119	112	99	38	83	13	39	570	61/
G. Hemsley, Moss Vale: Anconas	11	1	1	13	28	83	102	104	75	87	42	5	10	551	57/8
Mrs. T. Milsop, Arncliffe: Buff Leghorns	20	8	21	1	6	71	80	88	80	62	51	41	29	538	60/4
W. C. Freeman, Randwick: Minorcas	6½	1	6	21	47	24	104	93	67	60	97	10	0	530	57/6
W. Harris, Woy Woy: White Wyandottes	5½	16	3	0	20	54	107	92	72	72	40	22	24	522	56/3
E. J. Winton, Campbelltown: Minorcas	6	0	5	1	4	33	117	95	59	23	87	16	19	459	47/6

POTASH IN THE SOIL.

Its Function, Source, and Combinations.

Professor A. J. Cook, writing to the *California Cultivator*, on the function of potash, says:—

"Before I proceed to give the sources of potash and the kinds most to be sought after and purchased, I wish to add a word as to its use. Candidly, I doubt if science has progressed far enough to speak with certainty on this point, yet we may suggest a very reasonable theory. Analyses show that grain crops remove comparatively little potash. Grasses are not very greedy for it, while root crops, and especially the leaves, call loudest and demand most. Moreover, it is not evenly distributed in the plant, but accumulates most in the stems and leaves. May it not, then, be the province of the potash to promote the processes, as the chloride of sodium and potassium do in the animal body? May they not unite with the protoplasmic elements of the cell to stimulate osmosis or circulation? This circulation of sap from cell to cell is most important, and if potash does not assume this role, then what does? If this is its office, then it is a stimulus, and pushes general nutrition. It would then be most needed when the plant is working hardest, as when the leaves were pushing forth; when the plant was working rapidly, and when a great crop of fruit is being developed. If this is a correct theory, then if we need to add potash to our citrus orchards, it should be furnished as in the case of all plants, when the trees are working hardest. Would this not be in late summer and autumn, when the great crop of fruit is being formed, and the blossom buds are swelling to burst into bloom? I give this merely as a theory, and I believe it has much to support it.

"*Source of Potash.*—When a boy I helped my father, who cleared up a large, heavily timbered farm. I often noticed, as many have done, that when we burned a log heap there the wheat which we usually sowed in the new clearing was specially heavy. It must have been potash that did it, even on those rich virgin soils. Ashes, then, which consist of all the inorganic soil elements, contain only three that the soil really needs—lime, phosphoric acid, and potash. Most soils, indeed, have an abundance of lime, and the phosphoric acid of ashes is entirely insoluble, and so wholly unavailable. Thus it is the carbonate of potash of the ashes, of which there may be in wholly unleached ashes as much as 25 per cent., that stimulates the growth. Potassium carbonate is one of the best forms of this salt for immediate availability. Could we get unleached ashes easily and cheap enough we would need to look no further for our potash fertilizer. But we cannot. Coal and oil have banished wood so largely from our fuel supply that ashes are out of the question.

"*Potash Mines.*—Most rocks contain more or less soluble potash. This is ever being washed out and carried off to sea. In the evolution of the earth, as we study it, we note that some bays or gulfs, arms of the sea, were shut off from the general ocean, the water evaporated, and so great potash beds were formed. Those at Strassfurt, Germany, are peculiarly rich and valuable. Salt is formed from the sea in the same way, and the salt is often a companion of these potash salts of the mine. It was while boring to find rock salt that the Strassfurt potash beds were discovered. The beds of these old sea arms were clay coated, and thus the soluble potash deposits were imprisoned. Later a similar sheet of clay was added above, and so the soluble salts were wholly sealed up to await man's discovery and use. These potash deposits are of two kinds, chloride or muriate and sulphate. Of these the chloride is most ready to spread or diffuse in the soil, and so is slower to become fixed; yet, when fixed, its chlorine often unites with lime, making the plant-poison, chloride of lime. By applying this chloride some time before a crop is planted, we will, in humid regions, permit the washing out of the readily soluble lime chloride, and so mischief is prevented. In arid soils this washing out would not be done, and the muriate is undesirable. Some crops, like tobacco and potatoes, are said to be injured by the use of the chloride, yet in humid regions, and for most plants, this is excellent, and as it is the cheapest of the potash salts available it has rightly won no slight popularity. In our orchards the lime chloride is thought to be harmful, so the muriate is not in favour. The grade most in demand in the United States is 80 per cent. pure and holds about 50 per cent. actual potash. I think this can be laid down in large quantities at $50 (£10 8s. 4d.) per ton.

"Sulphate of potash, like the above, is also a manufactured article. It is always available and harms no crop, and is most favoured for orchard use. It is sold usually at 98 per cent. purity, with 53 per cent. actual potash. This is somewhat more expensive than the chloride, costing, in large lots, as much as $55 (£11 9s. 2d.) per ton. This is the best potash salt obtainable in the market. As both these salts are manufactured, we understand why they are uniform in their purity and of such high grade.

"Kainite is the crude Strassfurt salt. It contains only $12\frac{5}{10}$ per cent. potash, in form of sulphate. It also contains much sodium chloride or common salt. For this reason and the fact that there is so much worthless material to be transported, we can see why it is not in demand as a fertilizer in our section.

"Silvanite is like kainite, only it has muriate and sulphate of potash, about 16 per cent. in all. It has not been much used in the United States, and like kainite is not to be recommended for our California soils.

"We see, then, that we can use three forms of potash, carbonate (common wood ashes), not now in the market, chloride or muriate (not desirable here), and sulphate, which is the form for us. We should secure the manufactured, high-grade article, which ought to be procured in quantities for about $55 (£11 9s. 2d.) per ton.

"It is well-known that Dr. Hilgard has made hundreds of analyses of our California soils, and he says he has always found abundance of potash, often reaching, as stated above, considerable depth in the soil. Thus, Dr. Hilgard has stoutly maintained that it will be long years after our soils have been heavily cropped before we shall have to add any potash. Mr. Wallace is strongly of the opinion that many of our orchardists have injured their orchards by using too much of potash, and possibly using it at the wrong time of the year. He maintains that it qualifies the fruit, and thus is valuable in adding flavour or desirable qualities to the fruit. Some of our best orchardists are of the opinion that they have injured their orchards by the use of either too much potash or using it at the wrong time. Surely here is a great field for study and experiment."

ANSWERS TO CORRESPONDENTS.

Feeding Calves.—A correspondent writes asking for information as to the most successful way of rearing calves, at a week old, without the aid of the mother. The matter being referred to the field officer, Mr. Wicken replies:—"The following is the ration on which some of our stud bulls were reared at the Subiaco depôt, and as recommended by Dr. Sommerville, principal of the Durham Agricultural College, England. The ration is said to contain the same proportion of digestable food constituents as new milk:—Flour, one part by weight; ground linseed (no oil must have been extracted), two parts by weight; ground linseed oil-cake, three parts by weight. To prepare take 2¼lbs. of above mixture as one day's allowance for each calf, scald with boiling water, afterwards adding water to make up two gallons. This is recommended to be given in a tepid condition, divided into three meals to young calves, adding a little salt and sugar to sweeten. It should gradually be made to take the place of milk after the first fortnight.

GARDEN NOTES FOR JULY.

By Percy G. Wicken.

The dry weather experienced during the month of May will act as a check to the growth of garden crops, especially in the Eastern districts where the ground is too hard to allow of its being profitably worked. Rain, however, may be daily expected, and with the first heavy showers this state of affairs will soon be remedied. In the South-West districts the dry winters are rather an advantage, as it enables the swampy land to be cultivated for a much longer period without becoming too wet, but in the Eastern districts very little can be done in the garden until the rain sets in. The land should be dug up as deeply as possible and well manured with farmyard manure, so as to enable it to absorb and retain as much moisture as possible when the rain comes. Several frosts have occurred in the more Southern districts, and, although this may kill off a number of beans, maize, and other crops, it is of benefit in destroying insect pests and their larvæ, and in sweetening the soil. The ground should not be worked while too wet as this causes it to cake and become hard; it is always best to wait until it has dried a little before digging. If good vegetables are required, liberal supplies of either farmyard or artificial manure must be applied; vegetables want to be grown quickly, those which take a long time to mature owing to the want of plant food, become tough and fibery, those quickly grown are crisp and succulent.

Asparagus.—Prepare the land for planting, if not already done; dig a deep trench, and mix the soil with a plentiful supply of farmyard manure. In the warmer districts of the State the roots can be planted out. This is done by placing the roots in the trench, so that when the trench is filled up the crown of the roots will be about two inches below the surface, and the roots should be spread out to the fullest extent in the soft soil. The best way to do this is to fill the earth in the trench in the form of a mound; spread the root well over this mound, and then fill in the trench.

Artichokes (Jerusalem).—Ground should be prepared for planting out some of these excellent tubers towards the end of the month. There are two varieties, the white and the purple, distinguished by the colour of the tubers. They require to be well manured, and planted in rows three feet apart and from 12 to 18 inches apart in the rows.

Beans (Broad).—These should now be coming into bearing. A few more rows may be sown to keep up a succession.

Cabbage.—Sow seed of a summer variety, and plant out any young plants that are available. Cabbages are gross feeding plants, and require plenty of liquid manure.

Carrots.—Those already planted should now be showing above ground, and will require to be weeded and thinned out. A further supply of seed can be planted to keep up a supply.

Cauliflower.—The early-sown cauliflowers are now plentiful in the city markets. Plant out any well-grown plants that are available, and in cooler districts they may yet do well.

Cucumbers.—In warm localities where frosts are not likely to occur, seed for raising early plants may be sown. They will require to be sown in a hotbed, and to be well protected at night; the young plants will then be available for planting out next month.

Lettuce.—Plant out into beds any plants that are large enough for transplanting, and put out a supply of seed for future use.

Onion.—Plant out all seedlings that are large enough for the purpose, and sow a further supply of seed to keep up a succession. The ground requires to be worked up very finely.

Parsnip —Thin out and weed plants already coming up, and plant out a few rows of seed.

Peas.—Sow largely of this vegetable; they require to be sown from two to four feet apart, according as to whether they are dwarf or climbing varieties. There are a great number of varieties of peas obtainable; the best of the tall-growing varieties are Yorkshire Hero, Stratagem, Veitch's Perfection, and Telephone, and of the dwarf varieties—McLean's Little Gem, William Hurst, and American Wonder. Peas require plenty of potash, phosphoric acid, and lime as a manure, but no nitrogen.

Potatoes.—Early varieties may be sown during this month in most localities where late frosts are not likely to be severe.

Turnips.—A few more rows may be sown to keep up a supply.

Tomatoes.—Seeds may be sown in boxes in the warmer localities, and covered with glass to obtain a supply of early plants

Farm.—All cereal crops in the Eastern districts should now be sown, but, owing to the dry weather during May, ploughing has been delayed, and only those having fallow land have been able to get their grain sown. Good falls of rain having fallen early in June, every opportunity should be taken to push on with the ploughing and to get the crop in as early as possible. If the land is not too wet a good harrowing and rolling of the crop when about six inches high will probably have good results, and if the crop grows at all rank, it may be an advantage to turn a flock of sheep into it to eat it down, but the sheep should not be kept on too long or else they may damage the crop.

The end of the month is a good time to sow lucerne. The land must be free of weeds, deeply ploughed, and worked to a fine tilth if this crop is to be successful. The young plants are tender and require the full use of the ground, but when once they obtain a root hold they are able to hold their own. Lucerne is a very valuable plant, both as a green fodder and for making hay, and should be extensively grown.

THE CLIMATE OF WESTERN AUSTRALIA DURING MAY, 1903.

The month was characterised by moderately high barometers, and a very scanty rainfall over the South-West and South, and heavy rain throughout the Murchison and Coolgardie Goldfields.

Elsewhere normal conditions prevailed.

Practically no rain fell in the tropics; moderately heavy in the Gascoyne district towards the end of the month, chiefly on the 26th, and very heavy on the East Murchison Goldfields, and over the Coolgardie Goldfields from the 8th to the 12th.

In the agricultural districts, from Geraldton southwards, the fall was a long way behind the average, but general rain set in there on the 31st, and has quite altered the prospects of the farmers. Frosts have been recorded inland, as will be seen from the subjoined table, giving the average temperature and the lowest on the surface of the ground at selected stations.

TERRESTIAL MINIMUM RADIATION.

Station.	Mean.	Lowest.	Date.
Cue	50·0	43·0	20
Coolgardie	38·7	29·7	21
Southern Cross	43·0	30·0	18
Walebing	40·8	26·0	18
York	44·0	34·0	17
Perth Observatory	49·7	39·6	17
Wandering	37·6	27·0	18
Katanning	37·0	27·0	6
Bunbury	37·3	29·0	6
Karridale	41·0	31·0	7

The Climate of Western Australia during April, 1903.

	Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
						May, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham ...	29·974	29·984	30·124	29·829	89·8	73·5	81·6	96·8	59·0	90·7	71·2	100·4	58·0	2	4554
	Derby	29·971	29·991	30·094	29·845	89·8	64·2	77·0	93·8	49·2	89·6	63·6	98·8	46·0	*Nil*	2187
	Broome ...	30·030	29·988	30·141	...	89·1	65·2	77·2	96·0	50·0	87·7	62·0	97·3	46·4	*Nil*	1608
	Condon ...	...	30·040	...	...	...	...	...	...	...	81·9	56·1	98·0	42·0	*Nil*	897
	Cossack ...	30·016	30·050	30·163	29·886	85·6	64·7	75·2	91·1	56·2	82·8	62·0	96·5	51·0	*Nil*	892
	Onslow ...	30·020	30·038	30·180	29·880	84·0	64·0	74·0	89·0	55·0	83·4	59·0	95·0	45·2	*Nil*	247
	Carnarvon ...	30·039	30·074	30·188	29·923	79·3	60·4	69·8	89·6	52·5	79·4	56·7	91·3	43·0	246	304
	Hamelin Pool...	30·052	30·086	30·209	29·925	78·6	56·3	67·4	87·0	48·4	76·9	55·7	89·8	44·2	32	91
	Geraldton ...	30·090	30·116	30·260	29·950	75·0	54·0	64·5	85·0	46·0	73·9	55·3	89·0	39·3	34	111
Inland:	Hall's Creek *	...	30·060	...	...	78·4	58·9	68·6	90·5	38·9	84·6	54·9	98·0	36·4	*Nil*	3127
	Marble Bar ...	...	...	...	...	89·0	62·0	75·5	95·0	50·0	...	...	...	...	3	625
	Nullagine * ...	30·044	30·074	30·213	29·842	83·5	54·9	69·2	90·0	44·0	81·1	51·8	91·0	38·0	110	651
	Peak Hill ...	30·075	30·119	30·330	29·840	77·0	55·0	66·0	86·0	49·0	72·2	51·9	85·8	40·0	75	255
	Wiluna ...	30·110	...	30·372	29·977	73·9	50·7	62·3	82·3	41·5	...	...	...	...	314	452
	Cue	30·115	30·136	30·350	29·910	75·0	53·0	64·0	85·0	44·0	74·0	50·8	91·0	35·9	129	195
	Yalgoo ...	30·091	30·131	30·360	29·888	75·6	51·7	63·6	86·0	42·2	72·5	49·5	92·2	38·0	15	91
	Lawlers ...	30·100	30·158	30·399	29·850	70·9	51·1	61·0	79·1	42·1	70·3	49·1	86·0	34·0	176	570
	Laverton ...	30·204	...	30·479	29·891	69·1	48·9	59·0	71·4	31·3	...	...	...	...	162	615
	Menzies ...	30·185	30·172	30·468	29·900	67·0	50·0	58·5	77·0	38·0	68·9	48·2	89·0	32·1	339	929
	Kanowna ...	...	...	...	...	65·4	48·3	56·8	...	...	...	...	...	...	367	567
	Kalgoorlie ...	30·214	30·175	30·492	29·879	65·0	48·6	56·8	76·2	39·0	68·2	48·4	88·1	34·5	290	493
	Coolgardie ...	30·206	30·176	30·496	29·934	64·1	48·1	56·1	7·67	34·8	68·2	47·5	88·4	36·0	193	358
	Southern Cross	30·165	30·150	30·440	29·910	68·0	46·9	57·4	81·2	34·0	68·9	44·7	90·0	30·8	96	279
	Walebing ...	...	...	...	...	69·6	50·3	60·0	82·0	36·0	..	...	...	...	66	416
	Northam ...	...	...	...	...	68·5	47·2	57·8	81·0	36·0	...	...	...	...	68	246
	York	30·165	30·154	30·460	29·860	68·0	47·0	57·5	80·0	36·0	69·8	45·1	85·0	32·0	31	181
	Guildford ...	...	...	...	...	70·9	51·2	61·0	83·8	36·8	...	...	...	...	121	410

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Climate of Western Australia during May, 1903—*continued.*

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					April, 1903.					*Average for previous Six Years.					
	Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast:															
Perth Gardens ...	30·152	30·118	30·443	29·842	69·3	52·9	61·1	78·2	43·2	70·0	50·5	92·0	34·0	115	413
Perth Observatory	30·156	30·142	30·445	29·842	69·4	53·6	61·5	79·6	44·2	69·0	52·1	82·4	39·9	98	336
Fremantle ...	30·160	30·127	30·445	29·860	68·6	55·7	62·2	77·5	48·0	68·8	54·8	80·4	43·0	170	528
Rottnest ...	30·134	30·116	30·422	29·808	67·6	57·0	62·3	75·0	49·2	68·1	57·3	78·0	45·0	163	493
Mandurah ...	...	...	...	...	70·3	48·1	59·2	77·8	40·0	...	...	...	...	148	464
Wandering ...	...	...	...	...	65·1	41·4	53·2	77·0	31·0	...	...	...	...	132	418
Collie	...	...	...	...	66·6	40·0	53·3	77·5	30·0	...	...	...	...	177	469
Donnybrook ...	...	...	...	...	68·3	44·9	56·6	78·0	33·0	...	...	...	...	229	429
Bunbury ...	30·160	30·140	30·410	29·780	68·0	49·0	58·5	76·0	42·0	68·5	50·6	82·0	36·0	282	583
Busselton ...	...	...	...	...	67·4	47·3	57·4	74·5	35·0	...	...	...	...	260	511
Bridgetown ...	...	...	...	...	66·7	39·1	52·9	77·0	31·0	...	...	...	...	181	537
Karridale ...	30·095	30·125	30·360	29·680	68·0	49·0	58·5	77·0	35·0	67·7	48·8	81·1	33·2	320	906
Cape Leeuwin ...	30·120	30·087	30·400	29·660	66·0	56·0	61·0	78·0	49·0	66·1	56·4	78·8	44·9	182	532
Katanning ...	30·185	30·144	30·500	29·850	65·0	43·0	54·0	74·0	35·0	65·3	44·2	79·0	30·5	92	443
Albany	30·186	30·118	30·458	29·737	65·2	46·7	56·0	77·0	34·4	65·8	49·0	80·0	37·8	261	932
Breaksea... ...	30·185	30·118	30·450	29·760	62·0	52·0	57·0	76·0	46·0	64·4	54·2	78·2	43·0	200	685
Esperance ...	30·215	30·160	30·500	29·820	66·0	48·0	57·0	77·0	38·0	68·3	50·1	86·0	34·0	122	488
Balladonia ...	...	...	...	...	64·1	45·2	54·6	77·0	34·0	...	...	...	...	193	374
Eyre*	30·244	30·178	30·570	29·896	65·7	49·4	57·6	77·0	36·7	68·9	48·4	86·9	34·0	181	546
INTER-STATE.															
Perth	30·156	30·142	30·445	29·842	69·4	53·6	61·5	79·6	44·2	69·0	52·1	82·4	39·9	98	336
Adelaide	...	30·149	...	...	...	...	...	...	...	65·2	50·0	88·3	36·9	...	...
Melbourne	30·207	30·023	30·542	29·645	58·9	45·7	52·3	71·2	33·4	61·4	46·5	82·1	31·3	194	...
Sydney	30·200	30·088	30·550	29·890	64·0	53·0	58·5	73·0	45·0	64·8	51·9	83·5	40·2	323	...

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected except in the case of the Perth Botanical Gardens.

The Observatory, Perth,
7th June, 1903.

W. E. COOKE,

RAINFALL for April, 1903 (completed as far as possible), and for May, 1903 (principally from Telegraphic Reports).

Stations.	April.		May.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham	287	8	2	1
The Stud Station	...	...	...	...
Carlton	213	4	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs	...	...	...	...
Lisadell	308	3	...	...
Turkey Creek	432	11	Nil	...
Plympton, St. Mary	...	...	...	...
Koojubrin	...	...	...	...
Hall's Creek	470	11	Nil	...
Flora Valley	...	...	...	...
Ruby Plains	...	...	...	...
Denison Downs	300	...	...	...
West Kimberley:				
Obagama	451	6	...	...
Beagle Bay	291	7	...	...
Derby	842	10	Nil	...
Yeeda	...	...	...	...
Liveringa	...	...	...	...
Mt. Anderson	410	4	...	...
Leopold Downs	134	6	...	...
Fitzroy Crossing	108	5	1	1
Fitzroy (C. Blythe)	88	2	...	...
Quanbun	134	2	...	...
Nookanbah	...	...	...	...
Broome	625	6	Nil	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay	632	9	3	1
North-West:				
Wallal	422	4	Nil	...
Condon	475	4	Nil	...
DeGrey River	215	2	...	...
Port Hedland	50	3	11	1
Boodarie	...	...	...	...
Yule River	...	...	...	...
Warralong	243	5	...	...
Muccan	106	5	...	...
Ettrick	169	6	...	...
Mulgie	167	5	...	...
Eel Creek	77	4	...	...
Pilbarra	50	3	4	1
North-West—*cont.*				
Coongon	162	4	...	...
Warrawagine	...	...	...	...
Bamboo Creek	84	4	35	1
Marble Bar	145	7	3	1
Warrawoona	125	5	20	1
Corunna Downs	218	6	...	...
Nullagine	307	6	110	3
Mt. Edgar	262	4	...	...
Kerdiadary	82	5	...	...
Roy Hill	197	5	...	...
Mosquito Creek	74	4	...	...
Mulga Downs	87	3	...	...
Woodstock	...	...	...	...
Mt. Florence	94	2	...	...
Tambrey	72	4	...	...
Millstream	88	1	...	...
Yandyarra	...	...	...	...
Mallina	...	...	...	...
Whim Creek	78	2	Nil	...
Cooyapooya	...	...	...	...
Woodbrooke	25	1	...	...
Croydon	137	3	...	...
Balla Balla	Nil	...	Nil	...
Roebourne	27	1	Nil	...
Cossack	103	1	Nil	...
Fortescue	94	1	Nil	
Mardie	15	1	...	...
Mt. Stewart	...	...	...	...
Yarraloola	33	1	...	...
Chinginarra	...	...	...	...
Onslow	1	1	Nil	...
Peedamullah	...	...	...	...
Red Hill	109	4	...	...
Mt. Mortimer	228	4	...	...
Wogoola	..	...	...	...
Nanutarra	234	2	...	...
Yanrey	45	2	...	...
Point Cloates	Nil	...	...	...
Gascoyne:				
Winning Pool	3	1	42	3
Towara	98	4	...	...
Ullawarra	187	3	...	...
Maroonah	...	...	...	...
Gifford Creek	143	2	...	...
Bangemall	55	2	...	...

RAINFALL—*continued.*

Stations.	April.		May.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Gascoyne—*contd.*				
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	86	2	...	...
Yanyeareddy ...	126	3	...	...
Williambury ...	27	2	...	...
Wandagee ...	...	...	...	...
Bernier Island ...	22	2	...	...
Boolathana ...	22	1	16	3
Carnarvon ...	42	2	246	3
Cooralya	...	...	...	...
Doorawarrah ...	54	2	...	...
Mungarra ...	69	2	...	...
Clifton Downs ...	75	2	...	...
Dairy Creek ...	83	2	...	...
Upper Clifton Downs	110	3	...	...
Errivilla	194	3	...	...
Dirk Hartog Island	...	...	...	...
Sharks Bay ...	35	1	102	2
Kararang ...	50	2	...	...
Meedo	132	3	...	...
Tamala	...	...	...	...
Wooramel ...	132	2	106	2
Hamelin Pool ...	59	2	32	3
Byro	157	4	83	2
Yarra Yarra ...	102	2	60	3
Berringarra ...	56	2	60	3
Mt. Gould ...	...	...	...	...
Moorarie ...	135	2	58	4
Wandary... ...	200	4	70	4
Peak Hill ...	117	2	75	5
Horseshoe ...	116	3	87	6
Mt. Fraser ...	147	1	...	...
Abbotts	120	3	75	3
Belele	110	3	...	...
Mileura	138	2	53	4
Milly Milly ...	105	3	37	3
Manfred ...	165	3	37	3
New Forest ...	74	2	...	...
Woogorong ...	94	3	6	1
Billabalong ...	61	2	Nil	...
Wooleane ...	14	1	Nil	...
Murgoo	28	2	28	3
Meeka	10	1	54	3
Mt. Wittenoom ...	13	2	37	3
Nannine	23	3	46	3
Star of the East...	85	3	51	3
Annean	28	2	178	3
Tuckanarra ...	30	3	58	4

Stations.	April.		May.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Gascoyne—*contd.*				
Coodardy ...	22	3	...	...
Cue	27	2	129	5
Day Dawn ...	15	2	147	4
Lake Austin ...	5	2	194	3
Lennonville ...	4	2	57	4
Mt. Magnet ...	10	1	43	3
Warracoothara...	8	1	136	3
Challa	22	1	92	3
Youeragabbie ...	47	3	45	3
Murrum	Nil	...	41	1
Burnabinmah ...	86	3	59	2
Barnong	39	4	7	1
Yalgoo	51	3	15	2
Gabyon	79	3	11	1
Wurarga ...	55	5	...	...
Gullewa	22	4	5	1
South-West Division (Northern Part):				
Murchison House	67	4	...	...
Mt. View ...	64	3	...	...
Mumby	102	9	11	4
Northampton ...	108	5	3	1
Mt. Erin ...	102	4	...	...
Oakabella ...	85	4	34	4
Narra Tarra ...	58	3	60	3
Tibradden ...	67	7	28	5
Sand Springs ...	48	4	20	3
Mullewa... ...	29	5	5	1
Kockatea ...	25	3	3	1
Bootenal ...	80	3	3	1
Geraldton ...	34	3	34	6
Greenough ...	30	3	23	4
Dongara ...	122	7	16	2
Dongara (Pearse)	76	6	22	3
Strawberry ...	90	7	79	2
Mingenew ...	40	6	24	5
Urella	50	6	42	3
Yandenooka ...	52	4	14	2
Rothesay ...	17	3	28	2
Carnamah ...	56	7	11	2
Watheroo ...	97	5	43	6
Dandaragan ...	88	8	6	3
Moora	78	7	66	3
Yatheroo ...	104	7	135	7
Walebing ...	140	10	66	6
New Norcia ...	117	7	62	3

RAINFALL—*continued.*

Stations.	April.		May.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	142	13	166	7
Belvoir	225	10	116	8
Mundaring	465	11	214	6
Guildford	225	14	121	9
Kalbyamba	252	6	180	5
Canning W't'r'w'ks	274	13	93	6
Perth Gardens	268	17	115	12
Perth Observatory	216	15	98	13
Subiaco	182	13	107	12
Claremont	192	12	143	9
Claremont (Richardson)	165	11	...	...
Fremantle	314	14	170	12
Rottnest	315	14	163	11
Armadale	265	8	...	...
Rockingham	232	14	145	7
Canning River	284	9	...	...
Jarrahdale	336	10	122	8
Mandurah	275	12	148	10
Pinjarra	288	7	166	8
Yarloop	318	16	178	10
Harvey	333	12	167	7
South-West, Central Part (Inland):				
Hatherley	109	6	47	6
Momberkine	95	5	25	3
Monglin	164	8	28	6
Newcastle	68	5	73	6
Eumalga	128	9	98	8
Northam	127	9	68	4
Grass Valley	189	7	55	5
Meckering	195	9	35	7
Codg-Codgen	163	11	107	8
Jarragin	90	7	...	...
Doongin	193	7	65	7
Cuttenning	220	8	117	9
Whitehaven	154	10	77	10
Sunset Hills	181	9	46	5
Cobham	151	11	119	8
York	115	10	31	4
Beverley	110	7	69	4
Barrington	130	9	40	5
Stock Hill	196	10	54	2
Sunning Hill	285	11	96	5
Wandering	263	12	132	5
South-West—*contd.*				
Pingelly	248	8	100	2
Woogenellup	152	6	79	7
Marradong	267	9	128	6
Bannister	212	10	133	7
Narrogin	282	12	65	3
Wickepin	288	12	...	...
Gillimaning	293	11	66	4
Bunking	533	7	56	1
Bullock Hills	393	10	78	3
South-West Division (Southern Part):				
Bunbury	260	13	282	...
Collie	231	15	177	9
Glen Mervyn	256	11	197	7
Dardanup	233	12	227	5
Donnybrook	174	10	229	8
Boyanup	199	11	198	6
Ferndale	236	10	170	8
Busselton	199	11	260	8
Lower Blackwood	340	12	295	13
Karridale	426	19	320	10
Cape Leeuwin	262	17	182	10
Biddellia	434	13	317	10
The Warren	577	16	320	10
Lake Muir	414	17	159	12
Mordalup	358	18	...	...
Deeside	360	18	132	9
Riverside	370	17	149	9
Balbarup	372	15	188	8
Wilgarup	388	17	192	10
Bridgetown	305	18	181	6
Westbourne	312	19	165	12
Hilton	293	12	115	6
Greenbushes	212	8	284	6
Greenfields	186	11	136	6
Glenorchy	339	12	193	7
Williams	281	11	102	4
Arthur	316	8	39	2
Darkan	418	6	...	...
Wagin	359	9	83	2
Glencoe	376	12	74	3
Dyliabing	305	11	...	...
Katanning	327	12	92	5
Kojonup	504	12	172	6
Broomehill	325	15	102	5
Sunnyside	291	13	92	4
Woodyarrup	310	14	86	4

RAINFALL—*continued.*

Stations.	April.		May.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West—*contd.*				
Cranbrook ...	290	10	109	9
Blackwattle ...	313	12	90	4
Mt. Barker ...	394	17	165	10
Kendenup ...	265	14	100	8
St. Werburgh's...	...	...	133	11
Forest Hill ...	505	21	166	14
Denmark ...	...	...	307	...
Grasmere ...	600	16	304	13
Albany	531	19	261	12
Point King ...	536	16	270	7
Breaksea ...	372	20	200	13
Wattle Hill ...	582	16	183	10
Cape Riche ...	193	13	110	11
Pallinup ...	295	12	87	6
Bremer Bay ...	160	12	132	9
Eastern Division:				
Lake Way ...	39	4	314	7
Gum Creek ...	46	2	185	4
Mt. Sir Samuel...	126	6	156	6
Lawlers	97	4	176	6
Leinster G.M. ...	87	5	143	5
Lake Darlôt ...	149	4	118	5
Mt. Leonora ...	77	5	215	4
Mt. Malcolm ...	46	4	222	4
Mt. Morgans ...	50	4	197	4
Burtville ...	28	2	...	...
Laverton ...	53	5	162	3
Murrin Murrin...	77	4	266	5
The Granites ...	117	3	250	4
Tampa	58	3	332	4
Kookynie ...	41	3	266	4
Niagara	97	3	396	5
Yerilla	138	3	301	4
Edjudina ...	83	4	315	4
Menzies	127	4	339	6
Mulline	76	3	345	5
Waverley ...	208	5	321	7
Goongarrie ...	121	3	337	5
Mulwarrie ...	173	4	295	7
Kurawa	179	6	378	8
Kurnalpi ...	69	6	385	5
Bulong	103	6	274	10
Kanowna ...	113	3	367	...
Kalgoorlie ...	171	5	290	5
Eastern—*contd.*				
Coolgardie ...	103	3	193	7
Burbanks P.O. ...	165	5	196	7
Burbanks Birthday Gift	...	...	...	...
Woolubar ...	182	4	196	8
Widgiemooltha...	102	6	129	11
50-Mile Tank ...	181	6	128	9
Waterdale ...	83	5	...	...
Norseman ...	244	8	77	6
Bulla Bulling ...	131	5	62	6
Woolgangie ...	107	5	93	7
Boorabbin ...	84	5	128	9
Karalee	120	4	140	4
Yellowdine ...	78	5	146	5
Southern Cross...	113	7	96	6
Mt. Jackson ...	65	4	...	...
Bodallin ...	98	4	95	3
Burracoppin ...	90	4	127	5
Kellerberrin ...	174	7	113	7
Mangowine ...	134	7	90	8
Wattoning ...	115	5	...	...
Eucla Division:				
Ravensthorpe ...	157	12	77	8
Coconarup ...	204	10	...	...
Hopetoun ...	153	9	67	9
Fanny's Cove ...	157	6	...	...
Park Farm ...	166	13	131	10
Esperance ...	194	17	122	10
Gibson's Soak ...	188	14	136	9
30-Mile Condenser	229	13	146	9
Swan Lagoon ...	247	14	...	...
Grass Patch ...	195	9	95	10
Myrup	216	15	168	9
Lynburn ...	180	13	216	9
Boyatup... ...	217	12	...	...
Point Malcolm ...	164	18	213	12
Israelite Bay ...	83	12	243	11
Bulbinia... ...	98	10	...	...
Frazer Range ...	201	10	149	8
Balladonia ...	142	10	193	11
Southern Hills...	293	10	...	...
Eyre	246	16	181	12
Mundrabillia ...	...	...	...	...
Eucla	373	17	98	18

The Observatory, Perth,
10th June, 1903.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during May, 1903.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of														
					Apples.	Apricots.	Bananas.	Quinces.	Nectarines.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomeloes.	Pines.	All other fruits.
Fremantle ...	7094	6363½	730½	730½	2898½	...	791	...	...	373	5½	1666	26½	555	...	...	...	45	3
Albany	26	26	...	...	22	...	...	...	...	...	...	4	...	...	...	...	...	...	...
Geraldton ...	4	4	...	...	...	...	2	...	...	...	...	...	...	...	...	...	2	...	...
Esperance ...	17	17	...	...	9	...	..	...	2	...	...	2	...	4	...	...	...	...	...
Total ...	7141	6410½	730½	730½	2929½	...	793	...	2	373	5½	1672	26½	559	...	...	2	45	3

Department of Agriculture,
8th June, 1903.

Return of Fruit Trees and Plants imported into Western Australia during May, 1903.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.														
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	8	2282	8	2282	...	...	...	1431	64	252	56	6	45	...	...	50	170	112	60	12	...	...	24
Albany ...	3	18081	3	18081	...	...	...	1116	100	10000	400	400	100	207	...	58	400	1000	1000	1000	2000	...	300
Geraldton ...	2	75	2	75	...	...	...	50	...	...	...	...	...	...	...	...	25	...	...	...	...	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	13	20438	13	20438	...	...	...	2597	164	10252	456	406	145	207	...	108	595	1112	1060	1012	2000	...	324

Department of Agriculture,
8th June, 1903.

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